

AUTOMOTIVE INDUSTRIES

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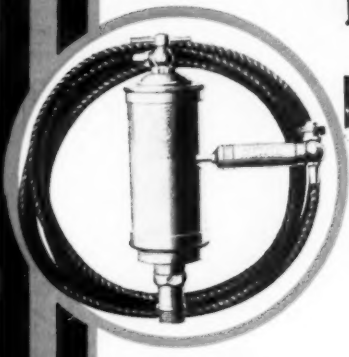


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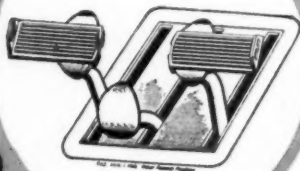
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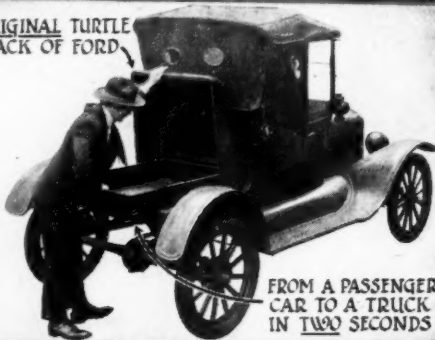
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BACK OF FORD



FROM A PASSENGER
CAR TO A TRUCK
IN TWO SECONDS



LOOK FOR THIS TRADE MARK



LOOK FOR THIS TRADE MARK

AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

VOL. XXXIX

NEW YORK, THURSDAY, OCTOBER 31, 1918—CHICAGO

No. 18

Hughes Aircraft Report a Vindication

Shows That There Has Been Some Incompetence and Stupidity
But None of the Gross Irregularities Charged

Rumors of Enormous Waste Found Untrue—Automotive Industry Put in Favorable Light—Some Individuals Censured—Squier Called "Incompetent"
—Deeds May Face Court Martial—Rebukes for Vincent, Mixer and Vrooman—Coffin Exonerated

By Allen Sinsheimer

WASHINGTON, Oct. 31—There has been no graft in the American air program.

There has been no profiteering.

There have been no pro-German or disloyal attempts by authorities to hamper the work.

There have been no criminal activities by members of the air boards, no dishonesty, wholesale or retail.

There are of course in this report some points that reflect seriously upon a few individuals. This was to be expected. Also there are points upon which there will be many diverse opinions, and this could have been anticipated.

But viewed in contrast with the Borglum charges of thievery and disloyalty and the later Senate denunciations, the Hughes Aircraft Report, issued here to-day, together with a brief statement of concurrence by Attorney General Gregory, is a complete vindication of the members of the aircraft boards, military and naval, of the engineers of the automotive industry AND OF THE INDUSTRY ITSELF.

It is particularly an exoneration of Howard E. Coffin, former chairman of the Aircraft Production Board, and establishes thoroughly the earlier claims that anti-administration influences were much too eager to heed the Borglum accusations.

In fact, with the background of extravagant charges of waste, traitorism and criminal activities that were spread broadcast last spring and dragged many good names in the mire, the few findings conveying censure in the Hughes report appear trivial, and the report must be regarded as being *practically a clean bill of health* for those in charge, both in the past and present.

The report is thorough. It is conservative. It savors of the work of a man who has quietly and exhaustively handled his job and made the sanest results from it. And it stands a complete contrast from the sensational and somewhat unreliable reports of the past that seemed bent more to establish delays than to understand or dispell them.

Careful perusal, while it may leave the impression that in some instances Mr. Hughes may have been too harsh, will at the same time leave the reader with the knowledge that it is the work of a conscientious man.

The charges made many times in Congress and the press and heard frequently that the \$650,000,000 appropriations have been wasted and thrown away are completely refuted at the outset by a statement that tells that, of the appropriations of \$691,851,866.47 made for the air program, only \$134,044,395.27 was disbursed to June 30, 1918, the end of the fiscal year, while at the same time 6171 planes and 12,633 engines had been produced.

High Lights of the Hughes Report

No graft; no profiteering; no disloyalty.

Col. Deeds charged with issuing false publicity, and improper official conduct.

Col. Vincent accused of violating criminal code, but without intent to defraud.

Cost-plus profits too liberal.

Signal Corps responsible for delays.

Some enemy alien employees found.

Little waste in aircraft appropriations.

Extravagant labor costs found.

Delays due to lack of knowledge and experience.

Charges of criminal action by members of the aircraft boards are shown to have been mere "gossip" by the statement that no member of the boards was found guilty of a criminal act.

It might naturally be expected that, among the many men taken from industrial life to fulfill positions as civil servants, some might follow their life-long industrial practices and, although actuated solely by altruistic motives, yet violate their positions, and this appears to be what has been done in some cases.

And, says the report in reply to the accusations that pro-Germanism prevailed, *there is no evidence to substan-*



Lt. Col. Jesse G. Vincent, prior to the war, was vice-president in charge of engineering for the Packard company at a salary of \$25,000 per year which he gave up to take up army aircraft work. He was the important designer in the work of designing the Liberty engine.

tiating the belief that work was hampered by disloyal authorities.

The most serious accusations made as a result of the investigation are against Col. E. A. Deeds, formerly in charge of the Equipment Division, Signal Corps; Lt.-Col. Jesse G. Vincent, who designed the Liberty engine; Lt.-Col. G. W. Mixter, formerly of the Signal Corps, and 2d Lt. S. B. Vrooman, formerly propeller inspector.

Col. Deeds, upon whom much of the charge of dishonesty fell last spring, was found by Mr. Hughes to be in no instance guilty of a criminal act. He did, however, says the report, act as a confidential adviser to a former business partner while in the service of the United States and was also guilty of issuing untrue publicity, and as a result the attention of the Secretary of War is demanded by the report and a recommendation for trial by court martial made.

The other officers named are charged with violations of a criminal code that prohibits army officers from engaging in official business transactions with concerns in which they are financially interested. In the case of Lt.-Col. Vincent, who was formerly vice-president in charge of engineering for the Packard Motor Car Co., Mr. Hughes, while discovering no fraud or intent to defraud, found that Vincent owned stock in the Packard company while at the same time he engaged in transactions with that company as an officer in the U. S. Army.

It is in connection with the recommendation that Vincent be prosecuted under the criminal code, violated because "officers fail to show proper appreciation of the impropriety" of violating this code, that the report may seem harsh to some. Vincent, as vice-president of Packard, earning a salary of \$25,000 a year, gave up that position to become a major in the army earning less than 20 per cent of that amount. He and C. V. Hall were the designers of the Liberty engine, America's greatest aeronautical achievement.

The report, which embodies a summary of 17,000 pages of testimony taken from 280 witnesses, deals principally with appropriations and expenditures, responsibilities, possible criminal activities, causes for delay in the program, contractors' profits, labor, the cross license agreement and forms of contracts.

What Deeds Said

Col. Deeds when interviewed by a representative of AUTOMOTIVE INDUSTRIES stated that he could not at this time make a public statement, and that in view of the possible trial by court martial he intends to refrain from all public discussion and make his reply to the charges to the War Department at the proper time.

Baker Considers Court Martial

Secretary of War Baker is considering the charges against Col. Deeds and the possibility of placing him on trial to face a court martial. Last Spring, when very serious charges were made, both General Squier and Col. Deeds requested the Secretary to institute a military court to investigate them. At that time, however, the Secretary preferred to await the outcome of the Hughes inquiry. Whether or not he will order the trial now of Col. Deeds will be decided following full consideration of the report.



Col. Edward A. Deeds, formerly Chief of the Equipment Division of the Signal Corps, was one of the founders of the Dayton Engineering Laboratories Co., manufacturers of the Delco ignition system. In addition he has been interested in other Dayton enterprises. He came to Washington in 1917 first as a member of the Aircraft Production Board and later with a commission in the Signal Corps of the U. S. Army.

It does not enter into the present status of aircraft production other than to state recent production figures and to give praise to the present authorities, and it does not tell future aircraft plans, regarding these as "military secrets."

Of the \$691,851,866.47 appropriated for aircraft, it is told in the accounts of expenditures that the obligations incurred during the fiscal year ending June 30, 1918, including not only production but also field construction, truck purchases, planting of castor beans, etc., amounted to \$474,910,706.55. This again contrasts strongly with the frequently heard remarks that the appropriations have been wasted. As a matter of fact, but \$24,000,000 has possibly been wasted, according to the report, and this in a manner that could be expected in an industry as new and untried as aviation.

This sum was expended for 1600 SJ-1 planes and Hall-Scott A7a engines costing \$11,027,733.61 and for the Bristol fighters that cost \$2,500,000 to date and will cost more when the charge for cancellation of the contract is presented. The SJ-1 planes were condemned as dangerous. The Bristol was an English plane in which our authorities attempted to place too heavy an engine.

Every nation in this war has expended many millions in similar manner—expenditures classed as for experimental work.

Full authority for the establishment of the air program and for the control and administration of all matters pertaining to aircraft production—a question that has confused many and to a degree forced the resignation of Howard Coffin—has definitely been placed upon Brig. Gen. George O. Squier, Chief Signal Officer, and in turn upon his assistants, Col. E. A. Deeds and Col. R. L. Montgomery.

The Aircraft Production Board, which was headed by Howard E. Coffin, and which, it will be recalled, was the center of the storm prior to the Senate investigation, was found by Mr. Hughes to be solely advisory, and from August, 1917, on gradually became less important. "It will be observed that the order creating this board," says the report, "had the

effect of greatly limiting its authority and that it was even denied the right to hold direct communication with manufacturing plants."

Commenting upon personal interests, Mr. Hughes stated that John D. Ryan, W. C. Potter and Howard E. Coffin were found to have taken no part in Government transactions with any concerns in which they had personal interests. Major H. C. Marmon was reported as having engaged in a trivial transaction but one that was in no way to be considered as seriously wrong and which was entirely without intent. All other members of the naval and military air boards were likewise exonerated of any criminal activities.

The findings against Col. Deeds followed exhaustive investigation. No substantiation was found of the claim that Deeds was earlier named "Dietz," and it was said, according to the report, that he had had four generations of ancestors in this country.

The inquiry developed that Deeds, together with Charles

The Hughes Report Recommends:

Trial by court-martial of Col. Deeds.

Enforcement of statutory conditions against Vincent, Mixter and Vrooman.

Investigation by Federal Trade Commission of proper costs of mahogany for propellers.

Supervision by Department of Justice of the re-audit of accounts.

Assignment of Bureau of Investigation, Department of Justice to follow up suggested delinquencies.

Investigation of spruce production on Pacific Coast.

Ryan Gratified with Report

"I have just hastily read the report of the aircraft investigation made by Judge Hughes," stated John D. Ryan, Director of Aircraft Production, "and I am gratified of course to know that the investigation has resulted in finding no such conditions existed last spring in the work of aircraft production as was indicated by charges made at that time. I have long been satisfied that the men who preceded me did a very great patriotic service and did not use their position with the Government to make personal profit."

F. Kettering, vice-president of the Dayton Engineering Laboratories Co., and H. E. Talbott, associated with Deeds in business, have a common agent, George B. Smith, who looks after their financial affairs jointly. A letter from Deeds to the Aircraft Board, stating that he had given up all interests in the United Motors Co., Dayton Engineering Laboratories Co., Dayton Metal Products Co. and the Domestic Building Co., was introduced in the report as bearing the date Aug. 28, 1917. Mr. Hughes reported that he found that Deeds retained his stock in the United Motors Corp. and the Domestic Building Co. for some time beyond that date, and further had made a transfer of his United Motors shares at a later time to Mrs. Deeds. But despite these conflicting conditions, he found no evidence that would indicate criminal activities on the part of the colonel.

Regarding the orders placed for Delco ignition systems for 20,000 Liberty engines, Mr. Hughes found that Deeds had made no recommendations for the placing of these orders and further that "while there had been a question as to whether the magneto or Delco system was preferable" it has lately developed that the use of the Delco is growing in favor.

The charges that Deeds acted as adviser to his ex-partner Talbott are based on correspondence showing that Deeds gave opinions of the Judge Advocate General to Talbott to guide him in the selection of appraisers of plants at the expiration of contracts and also informed him of the character of his superior officer, General Squier.

The claim that he gave out false publicity developed through the issuance of an erroneous statement about airplane production by Deeds to the Committee on Public Information. The statement was to the effect that the first American-built battle planes were shipped to France Feb. 1, 1918. Secretary of War Baker, who authorized the statement, it was found, gave his authority for its publication, relying upon Deeds for its accuracy. These actions on the part of Deeds were termed "highly improper" by Mr. Hughes and in consequence of them he demanded the attention of the military authorities.

The report deals at length with the earlier plans for airplane production, telling much that was told in the Senate report, but explaining in greater detail that many contradictory telegrams, signed "Pershing," but frequently sent by various other officers in France, delayed production in this country and caused much confusion.

For example, one cablegram on April 19, 1918, urged large production of single-seaters while another on May 4 disapproved single-seater production in the United States. As a result of the confusion, after much cabling, the authorities on this side were forced completely to disregard advices from abroad and make their own decisions in many cases.

There is considerable and strong censure in the report for the delay in the production of Handley-Page, Caproni and DeHavilland-9 planes. *It is shown that as early as Feb. 20, 1918, Howard Coffin urged immediate quantity production of Capronis here to be assembled in Italy. On March 26 production of Capronis was again taken up, discussed and referred to the Chief Signal Officer for consideration. On April 2 the Italian Ambassador inquired if there was any plan for producing Capronis. On April 23 a verbal order was given the Fisher Body Corporation for 250 of these planes. On May 9 other arrangements were made with the Fisher company, and in June they received a contract for 500 planes.*

"There appears to be no adequate reason," says the report, "for this long delay in putting the Caproni planes into production." As a result of the delays "nothing is left of last fall's program for service planes, save the DeH-4s."

The Liberty engine is given high praise in the report, and foreign experts are quoted in substantiation of its success.

In discussing the selection of contractors and the distribution of work, the report tells of many investigations, inspections and conferences between the aircraft authorities and the Singer Mfg. Co., of the excellent facilities of this concern and of the fact that it never received Government contracts, stating "in the light of the correspondence, no explanation has been given of the failure to enlist the important resources of the Singer company for the purposes of aircraft production."

CAUSES OF DELAY IN PRODUCTION WERE DUE, SAYS THE REPORT, TO LACK OF KNOWLEDGE AND

EXPERIENCE, DEFECTIVE ORGANIZATION IN THE SIGNAL CORPS, LACK OF INFORMATION AS TO EQUIPMENT FOR SERVICE PLANES, CHANGES IN DESIGN AND EQUIPMENT, CONDITIONS IN MANUFACTURING PLANES AND THE CHANGES IN THE LIBERTY ENGINE. "IT IS QUITE CLEAR," IT IS STATED, "THAT THE DUTY OF PROVIDING AN ADEQUATE ORGANIZATION FOR AIRCRAFT PRODUCTION WAS BEYOND THE COMPETENCY OF THE CHIEF SIGNAL OFFICER, WHO HAD NEITHER TRAINING NOR EXPERIENCE FOR SUCH A LARGE INDUSTRIAL ENTERPRISE."

The lack of airplane engineers was another serious obstacle, and the lack of organization and responsibility is pointed out. A letter from Archer A. Landon, Mr. Coffin's assistant, and at present in charge of aircraft production, is introduced in the report and tells of the various situations created by the "dilly-dallying" caused by the fact that no one would assume the responsibility for the work he undertook.

Complaints against the profits paid on both engine and plane manufacture under the cost-plus contract plan are frequent in the report. It is pointed out that the Dayton Wright Airplane Co. in a contract for DeH-4s was given a fixed profit of \$875 per plane, based on 12½ per cent of the bogey cost of \$7,000 while these planes actually cost under \$4,400, on which a fixed profit of 12½ per cent would have been about \$550. In addition, it is stated that the profits are not always based, as they should be, on the actual investments of the companies. The first bogey cost on the Liberty engines was fixed at \$6,087 and later reduced to \$5,000, on which basis a fixed profit of \$625 was arranged in contracts with the Packard, Lincoln and Nordyke & Marmon companies, and "even at this reduced bogey and percentage," says the report, "the profits allowed were very large." The Packard company, for example, delivered 3100 engines by Sept. 6, 1918, with profits amounting to \$1,937,500. In addition to the \$625 profit per engine, the actual cost of the engines at the Packard plant amounted to \$3,873 per engine for the first 600 and \$3,442 for the first 1200, making an additional profit of \$450 per engine through the contractor's percentage of saving.

The Ford Motor Co., it is expected, will be able to turn out these engines at \$3,200 per engine, and on its contract for 5000 engines will have received profits of \$625 per engine, plus \$450 per engine allowed by the saving clause, making a total of \$5,375,000 profits which can be earned on the complete contract. The Lincoln Motor Co. is mentioned as having a special feature in that it was a new organization with a newly established plant, devoted exclusively to Liberty engine manufacture, and its contract contains a clause allowing for depreciation of the company's heat-treating plant equal to the difference between its cost and value to the company at the termination of the contract, and that cost of its testing plant will be allowed as a part of the production cost of the engines to be manufactured, while the machinery and equipment used in the performance of the contract will be depreciated 40 per cent.

The Lincoln company received financial advances from the Government amounting to \$10,800,000 up to August, 1918. The cost of production on the first 600 engines was \$3,583, making it a reasonable assumption, says the report, that the average cost for the 6000 engines contracted for would be \$3,000; but on the basis of an actual cost of \$3,200 per engine, the report estimated the Lincoln company would have earned by January, 1919, on the delivery of 6000 engines, \$6,450,000, not including profits on spare parts of \$1,500,000, making a total of \$8,000,000. This is exclusive of the depreciations allowed, which in the testing and inspection facilities and special tools amounts to 100 per cent. The entire paid-in capital of the company, it is pointed out, in contrast to the estimated \$8,000,000 profit and depreciation allowances, amounts to \$850,000.

"It is pointed out very clearly," says the report, "that the company has provided an excellent plant for the manufacture of Liberty engines, and that ultimately its profit, after paying taxes, will represent only an equity in its plant, without any assured business, as it has been devoted to Government work. On the other hand, it may be said that there is a very liberal flat depreciation allowance on machinery, tools and equipment,

(Continued on page 750—40)

Complete Text of Hughes Aircraft Report

Washington, D. C., Oct. 25, 1918.

The Attorney General:

I have the honor to submit the following report of the Aircraft Inquiry:

The investigation has been concerned with aircraft production. Other activities relating to aviation, but not to production, have been touched upon incidentally. Thus, upward of thirty training or flying fields with numerous structures have been provided, and to meet other aviation needs a great variety of construction has been required, here and abroad. These enterprises, being aside from aircraft production itself, have not been the subject of this inquiry, save as transactions relating to Wilbur Wright Field and McCook Field have invited scrutiny by reason of the aircraft enterprises centered at Dayton, Ohio, and the activities of Edward A. Deeds and his former business associates.

Another governmental activity which does relate to aircraft production, but is conducted separately from the orders for airplanes and engines, is known as the sales department. The Government itself purchases large quantities of lumber, fabric, chemicals, etc., which it resells.

When these commodities are supplied by the Government to contractors, the sales department is credited and the items are transferred to the other appropriate accounts. The largest item of this sort is for spruce. The account of the sales department for the fiscal year ending June 30, 1918, shows that spruce orders amounted to \$76,211,360.35, on which there had been deliveries and payments aggregating \$6,357,853.83, leaving unfilled orders of \$69,853,506.52; and of the spruce delivered the Government had resold to the extent of \$3,679,155.95.

It appears that the Government had also (to June 30, 1918) invested in its cut-up plant at Vancouver, Wash., the sum of \$1,487,237.81. While to some extent testimony has been taken bearing on the spruce contracts, it became evident as the inquiry proceeded that it would be impossible to reach any satisfactory conclusion with respect to the transactions of the Spruce Production Division without a special inquiry on the Pacific Coast, which in view of the extent and character of the activities involved would probably take several months.

It has not been practicable to undertake this as yet, in view of the magnitude of the work involved in other branches of the investigation, and accordingly it has been left to be undertaken hereafter by the Department of Justice as it may be advised. For this reason, a report on the operations of the Spruce Production Division or of the Sales Department will not now be attempted. Also, in view of the importance of the present inquiry in its special relation to airplanes and airplane engines, transactions of the Balloon Division have not been examined.

Aside from these limitations, the inquiry has taken a wide range. It has been prosecuted without pause since it was begun in the latter part of May last. About 280 witnesses have been examined and over 17,000 pages of testimony have been taken.

The more important plants have been visited, and a large part of the testimony has been taken at these plants where books, records, employees and Government representatives have been available. To compass all the activities involved in aircraft production, reaching into a great variety of contracts and operations involving numerous plants and the expenditure of many millions of dollars, would require the constant efforts of a force of investigators for a year or more longer and also the services of an army of accountants charged with the responsibility of checking and auditing the work of the hundreds of Government representatives now supervising the contractors' accounts.

It is impossible, of course, to say what irregularities or offenses such a protracted inquiry would bring to light, but

the investigation has been sufficiently comprehensive to give, it is believed, a survey of the field as a whole and to disclose the facts bearing upon the serious charges which have been made.

In addition, and as a result of information received through this inquiry, there have been special proceedings before grand juries. Thus, on information of violations of the Sabotage Act at the Hammondsport (N. Y.) plant of the Curtiss Aeroplane & Motor Corp., the matter was examined by the Grand Jury and indictments were returned in the Western District of New York and there have also been indictments in the same district for violations of this Act at the North Elmwood plant, Buffalo, of the same corporation. There also has been a special investigation by the Grand Jury at Sacramento, with respect to conditions at the Liberty Iron Works.

It is manifestly impracticable to state the details of even the more important evidence, but the salient and controlling facts which have been elicited will be set forth, so far as this is deemed to be compatible with military exigency.

FIRST APPROPRIATIONS AND EXPENDITURES

At the time of the time of the declaration of a state of war with Germany, April 6, 1917, the appropriations available for aircraft production were those applicable to the fiscal year ending June 30, 1917. By the Act of Aug. 29, 1916, the sum of \$14,281,766 was appropriated for the expenses of the Signal Service, with the proviso that not more than \$13,281,666 should be used for the purchase, manufacture, maintenance and operation of aircraft and of described vehicles necessary for the Aviation Section.

It was further provided that not to exceed \$50,000 should be used for the payment of all expenses in connection with the development of a suitable type of aviation motor and not more than \$500 should be used for the cost of special technical instruction of officers of the Aviation Section.

Of the total appropriation above mentioned the sum of \$4,500,000 was later (Act of May 12, 1917) made available for the establishment of aviation schools and experimental stations, and it was under this appropriation that Langley Field, Virginia, was acquired and developed.

The Act of Feb. 14, 1917, appropriated \$3,600,000 for aircraft, buildings for equipment, and other accessories necessary in the Aviation Section, for use in connection with sea-coast defenses.

The Act of May 12, 1917, appropriated for the expenses of the Signal Service, for the fiscal year ending June 30, 1918, the sum of \$11,800,000, with the proviso that not more than \$10,800,000 should be used for aircraft production, including experimentation, and for the buildings for equipment and personnel, and necessary accessories. The sum of \$43,450,000 was appropriated by the deficiency appropriation Act of June 15, 1917, of which \$31,846,067.16 became available, under the terms of the Act, for the fiscal year 1917-18.

Provision for an adequate aircraft program for the Army was not made until the passage of the Act of July 24, 1917, appropriating for aeronautical purposes the sum of \$640,000,000.

STATEMENT FOR FISCAL YEAR JUNE 30, 1917, TO JUNE 30, 1918

The aggregate of all aeronautical appropriations which were available for the Army for the fiscal year ending June 30, 1918, were as follows:

Act of July 24, 1917.....	\$640,000,000.00
Other aeronautical appropriations.....	51,851,866.47
Total	\$691,851,866.47

The estimated obligations charged against these appro-

priations during the fiscal year amounted to \$933,948,959.03. To the extent of \$176,924,903.42, this excess represented obligations of the Sales Department already described, for which it was contemplated there would be reimbursement by resales. (Of this last-mentioned amount, there were reported as disbursed in the Sales Department (to June 30, 1918) that is, for deliveries of materials, \$25,966,739.95* the resales amounting to \$19,008,150.26, and the balance representing assets on hand.) Exclusive of the obligations of the Sales Department, the estimated aeronautical obligations of the Government for the fiscal year 1917-1918 amounted to \$757,024,055.61. These obligations were calculated on estimated costs, and the excess over the total aeronautical appropriations (that is, over \$691,851,866.47) will largely be offset by savings on the estimated costs and by cancellations of orders.

Obligations Other Than for Airplanes and Engines

The estimated obligations for the Aviation Equipment Division covered not only Airplanes and Engines, but a variety of equipment and other essentials. Thus, the estimated obligations, charged against the \$640,000,000 appropriation, for Transportation including motor trucks, chassis, motor cycles, bicycles, etc., amounted to \$42,938,630.73; for General Equipment including various sorts of apparatus and supplies \$34,979,741.53; for Maintenance including maintenance of supply depots, planting of castor beans, etc., \$17,948,955.60; for Special Clothing for aviators, mechanics, etc., \$2,520,512.63; for Machine Guns, Ammunition and Bombs, \$29,249,033.29; for Acquisition of Plants, \$2,595,599.83 and for Miscellaneous Equipment, including various incidental expenses of officers, stations and schools, \$7,748,617.75.

There were also charged against the \$640,000,000 appropriation the estimated obligations of the Construction Division, embracing training fields and construction here and abroad, amounting to \$62,232,664.55; of the Balloon Division (covering balloons and accessories), \$16,910,891.20; of the Schools Division, \$1,016,223.48, and of the Finance Division (including the pay of Reserve Corps and of civilian employees, and the reserve for foreign expenditures), \$35,963,417.55. The various estimated obligations for similar purposes, other than for airplanes and engines, which were charged against the other aeronautical appropriations for the fiscal year 1917-1918, aggregated \$28,009,060.92.

Thus, out of the total estimated obligations (\$757,024,055.61) for all aeronautical purposes (exclusive of the Sales Department) the estimated obligations for purposes other than airplanes and engines aggregated \$282,113,349.06.

Obligations for Airplanes and Engines

The amount of the estimated obligations for airplanes and engines and spare parts of both (including experimental and development work) charged, to June 30, 1918, against the aeronautical appropriations for the fiscal year 1917-1918 was as follows:

Charged to the \$640,000,000 appropriation.....	\$457,379,122.15
Charged to other appropriations	17,531,584.40
Total	\$474,910,706.55

Actual Disbursements for All Aeronautical Purposes

It should be noted that the amounts above stated represent estimated obligations, not actual disbursements. Although obligations were incurred, payments were to be made only as payments were earned by performance of contracts. Payments prior to June 30, 1918, were made on vouchers for amounts represented as earned, but such payments were only a part of the estimated obligations, by reason of delays in production. Further payments should be made only as production goes forward and contracts are duly performed.

Thus, as against the total estimated obligations for aeronautical purposes aggregating \$933,948,959.03 (including the sales department), the disbursements reported down to June 30, 1918, amounted to the sum of \$430,234,316.99. Out of the \$640,000,000 appropriation, the total disbursements for the fiscal year for all aeronautical purposes (that is, embracing those apart from airplanes and engines, as well as for the latter) amounted to \$363,818,014.87;† and, according to the accounts of the Bureau of Aircraft Production there remained of this appropriation in the Treasury of the United States on June 30, 1918, the sum of \$276,181,985.13. According to the books of the Treasury Department, the unexpended

balance of the \$640,000,000 appropriation amounted on June 29, 1917, to \$304,478,211.70. The difference of \$28,296,226.57 is explained by the existence of unwithdrawn balances which had been allotted to the Quartermaster Corps and the Ordnance Department and by various credits pertaining to the month of June which were not received in the Bureau of Aircraft Production until July.

Actual Disbursements for Airplanes and Engines

The actual payments for the fiscal year 1917-1918 against the estimated obligations for airplanes and engines, and spare parts of both (including payments for experimental and development work) are reported by the Finance Division of the Bureau of Aircraft Production as amounting to \$155,535,946.41, as follows:

Disbursed from the \$640,000,000 appropriation.....	\$142,908,398.95
Disbursed from other appropriations.....	12,627,547.46

Total

These disbursements included not only payments to contractors for articles delivered or on account of work and materials, but also advances in the nature of loans to contractors, upon security, made by the War Credits Board, and, in addition, the payments which had been made for the manufacture of planes and engines overseas.

The payments for manufacture overseas amounted to \$25,605,074.31, as follows:

Cash remittances to overseas disbursing officers for payment on overseas contracts for airplanes and engines	\$16,600,000.00
Paid on purchase of materials, supplies, etc., purchased by United States for shipment abroad to be used in overseas manufacture of airplanes and engines	\$9,005,074.31
Total	\$25,605,074.31

The unpaid balances of advances to contractors (whose contracts are embraced in the obligations for airplanes and engines above described), these advances being repayable to the Government, amounted on June 30, 1918 (exclusive of interest) to \$21,491,551.14. The principal contractors who have received these advances are specified below:

Contractor	Advances Authorized	Advances Made	Balance Unpaid June 30, 1918 (Without Interest)
Curtiss Aeroplane & Motor Corp.	\$8,000,000	\$8,000,000	\$5,561,645.94
Dayton Wright Airplane Co.	2,500,000	2,000,000	1,405,222.57
Duesenberg Motors Corp.	1,650,000	1,650,000	1,632,447.97
Fisher Body Corp.	2,000,000	2,000,000	1,944,933.33
Lincoln Motor Co.	6,500,000	6,500,000	6,255,392.00
Nordyke & Marmon Co.	2,000,000	2,000,000	2,000,000.00
Packard Motor Car Co.	5,000,000	5,000,000	1,731,232.00
Trego Motors Corp.	315,000	285,000	281,695.70
Willys-Overland Co.	2,500,000	2,500,000	451,861.25
Various other contractors.			227,120.38
Total			\$21,491,551.14

The amounts paid, to June 30, 1918, on account of experimental and development work on airplanes and engines, amounted to \$1,697,830.19, of which the principal items are these:

Expenditures of Experimental Station at McCook Field	\$974,300.20
Director, Bureau of Standards.....	64,077.33
Department of Agriculture.....	34,540.82
Packard Motor Car Co.....	249,159.10
†Dayton Wright Airplane Co.....	48,120.39
Dayton Metal Products Co.....	66,097.14
Miscellaneous payments	261,535.21
Total	\$1,697,830.19

Deducting these advances, and the payments of experimental and development work, the disbursements to the end of the fiscal year, June 30, 1918, for airplanes and engines, and their parts, manufactured or in process of manufacture in the United States amounted to \$106,741,490.77, as follows:

Total disbursed for airplanes and engines.....	\$155,535,946.41
Less—	
For overseas manufacture.....	\$25,605,074.31
For advances to contractors.....	21,491,551.14
For experimental and development work	1,697,830.19
Disbursed on account of production in United States.....	\$106,741,490.77

*Corrections on further accounting raised this amount to \$26,557,706.87.

†Subject to correction by addition of \$590,966.62 for Sales Department.

*This includes the compensation of the purchasing agent, The J. G. White Engineering Corporation, amounting to 3 per cent of the purchases, or \$262,662.02.

†Other vouchers allowed before June 30, 1918, but not paid until later, \$89,630.52.

AIRPLANES AND ENGINES DELIVERED DURING
FISCAL YEAR ENDING JUNE 30, 1918

The reported deliveries of airplanes and engines made prior to June 30, 1918, are as follows:

Airplanes

Elementary Training Planes		
JN4-D	2972	
SJ-1	1600	4572
Advanced Training Planes		
JN4-H		
Training	402	
Gunnery	321	
JN6-HB	100	
S4-B	100	
S4-C	73	
Penguin	50	1046
Combat and Bombing Planes		
DeH-4	529	
Bristol Fighter	24	553
Total planes		6171

Engines

Elementary Training		
OX-5	5474	
A7a	2188	7662
Advanced Training		
Hispano 150 hp.	2188	
Gnome 100 hp.	209	
Le Rhone 80 hp.	68	
Lawrence 28 hp.	114	2579
Combat and Bombing		
U. S. 12 Cylinder (Army Type)	1615	
U. S. 12 Cylinder (Navy Type)	775	
Hispano 300 hp.	2	2392
Total engines		12633

For some of the units thus delivered, payments had not yet been made at the close of the fiscal year. The payments to June 30, 1918, covered about 5530 of the airplanes delivered and about 9750 of the engines delivered. In addition, there had been deliveries of various planes and engine parts, and the greater part of these were also covered by the payments above mentioned. And there were also large payments to contractors under cost-plus contracts for labor, materials and overhead charges in connection with work in process.

Allocation of Payments to June 30, 1918

The payments for the production of airplanes and engines, and parts, were made under two classes of contracts, (1) fixed-price and (2) cost-plus contracts:

Payments under fixed-price contracts	\$57,193,621.06
Payments under cost-plus contracts	49,547,869.71
	\$106,741,490.77

Fixed-Price Contracts

In the case of payments under fixed-price contracts, the payments presupposed delivery to and acceptance by the Government of the articles contracted for. Most of the JN training planes, 150 of the Standard J-1 training planes, metal parts for Handley-Page planes, all the engines for the elementary training planes, and 1500 of the Hispano-Suiza 150-hp. engines are embraced in the orders placed on a fixed-price basis. Large numbers of parts of planes and engines were ordered on the same basis.

The payments under fixed-price contracts are shown to have been distributed as follows:

For engines and their parts	\$23,216,930.28
For airplanes and their parts	33,976,690.78
	\$57,193,621.06

Cost-Plus Contracts

The cost-plus contracts for engines and parts related to the Liberty engines (U. S. 12s), most of the Hispano-Suiza, and the Le Rhone, Gnome and Bugatti engines. Among airplanes, 1450 of the Standard J-1 elementary training planes, the De Haviland 4 and Bristol service planes, and the Handley-Page wood parts, were under cost-plus contracts. The following is the distribution of payments under cost-plus contracts to June 30, 1918:

For engines and their parts	\$28,348,487.44
For airplanes and their parts	21,199,382.27
	\$49,547,869.71

These payments (being exclusive of advances in the nature of loans) embraced (1) cost of special tools and "increased facilities" owned by the Government but located in contractors' plants, (2) fixed profits on completed units delivered, (3) royalties on completed units delivered, (4) cost of manufacture of completed units delivered, and (5) payments for

work in process, that is, for materials, labor and overhead expense applicable to units in course of production. The distribution of these payments to June 30, 1918, is:

Special tools and increased facilities owned by Government	\$6,840,971.70
Fixed profits on completed units delivered	3,279,028.18
Royalties on completed units delivered	374,986.40
Payments to June 30, 1918, under cost-plus contracts for labor, materials and overhead charges applicable to delivered units and to work in process	39,052,883.43
	\$49,547,869.71

It is impossible at this time, by reason of the state of the accounts, to divide the last item covering cost of manufacture so as to give separately the manufacturing cost (exclusive of fixed profits and royalties) of the units which had been delivered and the cost of work in process at the close of the fiscal year.

APPROPRIATIONS AND OBLIGATIONS FOR FISCAL
YEAR JUNE 30, 1918, TO JUNE 30, 1919

Continuance of Prior Appropriations

The Act of July 9, 1918, making appropriations for the fiscal year 1918-1919, continued the prior appropriation of \$640,000,000, and other aeronautical appropriations, thus making them available for the present fiscal year and for the payment of obligations incurred prior to the passage of the Act. Under this provision the production orders given in the last fiscal year, which remain uncanceled, will be continued and payments will be made in accordance with the terms of the existing contracts as production progresses.

New Appropriations

The Act of July 9, 1918, also made a new appropriation for the Air Service of \$884,304,758. This appropriation is available for the purchase, manufacture, maintenance, repair and operation of airships, war balloons and other aerial machines, with equipment, aviation stations, schools and fields; for the expenses of officers, enlisted men and civilian employees; and also for training, experimental work, creation, expansion, acquisition and development of plants, etc. Of this amount, there has been apportioned for Air Service Production the sum of \$760,000,000, of which \$200,000,000 has been set aside for airplanes, their spare parts, instruments and accessories, \$250,000,000 for engines, their repair parts, instruments and accessories, and \$200,000,000 for foreign expenditures. Various items for balloons, oils, gases and chemicals, transportation, plants, miscellaneous equipment and supplies, experimentation, and pay of Reserve Corps and civilians make up the remainder.

Against this new appropriation, thus apportioned, the obligations incurred to Sept. 30, 1918 (exclusive of the Sales Department) amounted to \$151,580,503.35, of which \$21,603,470.90 is for airplanes, their spare parts, etc., and \$102,746,372.91 is for engines, their repair parts, etc. The total payments against the new obligations amounted, to Sept. 30, 1918, to \$3,670,707.66 (exclusive of foreign expenditures and transfers to other departments), leaving then unexpended of the new appropriation of \$760,000,000, apportioned to Air Service Production, the sum of \$756,329,292.34.

Payments Since June 30, 1918, and Total Payments to Date

The last financial reports available are of Sept. 30, 1918. The disbursements to that date which were made after June 30, 1918, for all aeronautical purposes and were chargeable to the appropriations for the prior fiscal year (continued as above stated) are as follows:

Disbursed from the \$640,000,000 appropriation (Act of June 24, 1917)	\$128,265,038.31
Disbursed from other aeronautical appropriations	7,250,915.36

Total disbursed since June 30, 1918, under prior appropriations for aeronautical purposes

The total disbursements for aeronautical purposes from June 30, 1918, to September 30, 1918, are in the aggregate:

Under appropriations prior to June 30, 1918	\$135,515,953.67
Under appropriations after that date, as above	3,670,707.66
Total	\$139,186,661.33

These disbursements for all aeronautical purposes can not at present be apportioned so as to show separately the amounts disbursed since June 30, 1918, for airplanes and engines and parts.

Deliveries to October 11, 1918

The total deliveries of airplanes and engines (exclusive of spare parts) to Oct. 11, 1918, appear, by the Government's reports, to be as follows:

Training Planes

	Since June 30, 1918	Total to Oct. 11, 1918
JN-4D	615	3587
SJ-1		1600
JN-4H and JN-6H	609	1432
S4-B		100
S4-C	225	298
Penguin	245	295
E-1	12	12
	1706	7324

Engines for Training Planes.

OX-5	2532	8006
A-7a (Hall-Scott)	62	2250
Gnome 100 H.P.	69	278
LeRhône 80 H.P.	679	747
Hispano 150 H.P.	824	3012
Lawrence	328	442
	4494	14,735

Service Planes.

DeHaviland-4s	1821	2350†
Handley - Page (parts 85% complete)	100*	100
Le Pere	5	5
SE-5	2	2
	1928	2457

Engines for Service Planes

Liberty (U.S.)-12s	7299	9689†
Hispano 180 H.P.	242	242
Hispano 300 H.P.	3	5
Bugatti	1	1
	7545	9937

*25 sets of wooden parts and no metal parts delivered to June 30, 1918.

†Since the above was prepared information has been received that, to Oct. 18, 1918, 2556 DeHaviland-4s and 10,568 Liberty (U.S.)-12s have been delivered.

PAYMENTS FOR AIRPLANES CONDEMNED

Standard J-1 Training Planes

This type of plane was condemned as dangerous, in June, 1918, because of the unsuitability of the motor (Hall-Scott, A7a) used with it. There were 1600 of these SJ-1 planes ordered and delivered, and all deliveries had been made prior to June 30, 1918. The entire amount disbursed for these planes and their spare parts to Sept. 30, 1918, the date of the last financial statement, is \$11,027,733.61, of which \$8,593,576.11 was under cost-plus contracts.

There were 2250 A7a engines ordered for these planes all of which, with parts, have been delivered. The amount disbursed for these engines, and parts (exclusively under fixed-price contracts) to Sept. 30, 1918, amounted to \$6,487,134.75.

The aggregate cost of the SJ-1 planes with the A7a engines with spare parts, to Sept. 30, 1918, amounted to \$17,514,868.36.

There appears to have been no defect in the SJ-1 plane itself, and there is an expectation that it may be utilized by the installation of another engine. The cost of adapting these planes to such an installation may amount to \$2,000 a plane.

What salvage may ultimately be gained in this way, or on the A7a engines, cannot now be determined.

Bristol Fighters

The Bristol Fighter was condemned as unsafe in July, 1918. A contract for 2000 of these planes and for 1200 sets of spare parts had been placed with the Curtiss Aeroplane & Motor Corp. on a cost-plus basis at an estimated cost of \$19,190,100. Orders were also given to the Hayes-Ionia Co. and to the Lewis Spring & Axle Co., each for 400 sets of spare parts, at the estimated cost of \$1,890,000, or \$3,780,000 in all. The estimated cost of the Bristol planes and spares was thus \$22,970,100.

Only 27 had been delivered prior to cancellation, but there was a large amount of work in process. The amount shown by the accounts of the Bureau of Aircraft Production to have been paid on these contracts to Sept. 30, 1918 (exclusive of "increased facilities" owned by the Government), is about \$2,350,000. Taking the materials purchased for the Bristols, the labor and estimated overhead charges, it would appear that the total amount expended by the Curtiss Co. in the course of the production of the Bristols was about \$3,000,000. This does not include any claim for damages for the cancellation of the contract. The Finance Division of the Bureau of Aircraft Production makes a general estimate (which includes unpaid vouchers and possible claims for damages growing out of the cancellation of contracts) that the aggregate cost of the Bristol will amount to about \$6,500,000. What salvage there may be on the materials cannot now be determined.

The Liberty engines intended to be used in the Bristols can be utilized in other planes.

On this estimate, the cost to the Government of the SJ-1

planes (with engines), and on the Bristol planes, subject to reduction by whatever salvage there may be, amounts to \$24,000,000.*

*Further information has been received that a contract is contemplated under which about \$3,500,000 of Bristol parts may be used in a new type of plane, which, if successful, would reduce the estimated loss on the Bristols to \$3,000,000 and the total loss on SJ-1s and Bristols, subject to salvage on the SJ-1s, to \$20,500,000.

SECOND. RESPONSIBLE OFFICERS AND ADVISORY BOARDS

By the Act of July 24, 1917, full authority was given to the President to provide, through the War Department, for the purchase, manufacture, maintenance and operation of all types of aircraft, with all necessary equipment.

Signal Corps

Under the Secretary of War, the authority to establish the aircraft program and the control and administration of matters relating to aircraft production for the Army were vested in the Chief Signal Officer, Brigadier-General George O. Squier. It was under his direction that the organization of the Aviation Section of the Signal Corps, with its various departments of production, supply, inspection and accounting, was effected. The matter of aircraft production was intrusted to the Equipment Division, which was organized on Aug. 2, 1917.

Edward A. Deeds was made Chief of this Division with Sydney D. Waldon as his assistant. At the same time Robert L. Montgomery was made Chief of the Finance and Supply Division. There was a reorganization on Aug. 29, 1917, by which these two divisions were abolished and the functions of both were transferred to a new Equipment Division with Edward A. Deeds in charge.

Robert L. Montgomery was made the head of the Finance Department of the Equipment Division. Deeds, Montgomery and Waldon had been members of the Aircraft Production Board and in or about August, 1917, they were commissioned with the rank of Colonel.

Thus, Colonel Deeds as the head of the Equipment Division had direct charge, under the Chief Signal Officer, of all matters relating to aircraft production. On Jan. 14, 1918, Colonel Deeds became Industrial Executive in the Executive Division of the Signal Corps and was succeeded by Colonel Montgomery as head of the Equipment Division, but despite the change in technical relation it is apparent that Colonel Deeds remained in practical charge, under the Chief Signal Officer, of production. In February, 1918, William C. Potter became the head of the Equipment Division and remained in this position until the passage of the Act of May 20, 1918.

Bureau of Aircraft Production

By order of the President, dated May 20, 1918 (promulgated May 24, 1918) the Chief Signal Officer was put in charge of military signal duties, not connected with the Aviation Section; General W. L. Kenly was appointed Director of Military Aeronautics and charged with the duties which had formerly pertained to the Aviation Section, except so far as they related to aircraft production, and for the latter purpose the executive agency known as the Bureau of Aircraft Production was established. John D. Ryan was appointed head of this Bureau and thus became Director of Aircraft Production, Mr. Potter taking the post of Assistant Director.

ADVISORY BODIES

National Advisory Committee for Aeronautics

By the Act of March 3, 1915, an Advisory Committee for Aeronautics was established to consist of two members from the War Department, two from the Navy Department, a representative each of the Smithsonian Institution, of the United States Weather Bureau, and of the United States Bureau of Standards, together with not more than five additional persons qualified as experts. The prescribed duty of the Committee was to supervise and direct the scientific study of the problems of flying with a view to their practical solution. This body has been continuously maintained; it has examined numerous inventions and has been engaged in scientific study. But it has had nothing to do with the formulation of the aircraft program or with decisions as to the types of planes or engines selected for production.

The Committee was also active in securing the adjustment reflected in what is known as the cross-license agreement for the payment of royalties for the use of patented inventions pertaining to aircraft.

Joint Army and Navy Technical Aircraft Board

This Board was constituted in the early part of May, 1917. It was composed of officers of special qualifications by reason

of scientific study and experience, who were designated by the Secretary of War and the Secretary of the Navy respectively. The declared purpose was to "standardize, so far as possible, the designs and general specifications of aircraft except Zepelins." The Board has been in continuous existence and has made various recommendations. These, however, have not been controlling and the Board has had no authority to enforce its views.

Aircraft Production Board

The Aircraft Production Board was created in May, 1917, pursuant to a resolution of the Council of National Defense. Its function was solely advisory. The initial steps in organization were taken under the authority of the Council of National Defense by Howard E. Coffin, who became Chairman of the Board and selected the civilian personnel consisting of Edward A. Deeds, Sidney D. Waldon and Robert L. Montgomery. Mr. Coffin—Vice-President of the Hudson Motor Car Company—was a member of the Advisory Commission of the Council of National Defense. Mr. Deeds had been engaged in manufacturing enterprises at Dayton; in April, 1917, he had been appointed a member of the Munitions Standards Board and placed on the Sub-Committee on Fuses and Detonators. Mr. Waldon had formerly been a Vice-President of the Packard Motor Car Company. Mr. Montgomery was a member of the firm of Montgomery, Clothier & Tyler, bankers and brokers, of Philadelphia. In addition to the four civilian members, the Chief Signal Officer and Rear Admiral D. W. Taylor, Chief of the Bureau of Construction, were appointed members of the Board representing the Army and Navy respectively.

While the Aircraft Production Board had no authority to commit the Government, the Board was continuously active in the formulation of programs and the adoption of resolutions of advice. Numerous contracts for airplanes and engines were placed upon its recommendation. When the Equipment Division of the Aviation Section of the Signal Corps was organized in August, 1917, the work of the Board became of less actual importance, though it was still conspicuous in routine. Colonel Deeds, Colonel Waldon and Colonel Montgomery now had executive duties in the Equipment Division under the Chief Signal Officer and for the most part the recommendations relating to the Army aircraft program naturally followed the views of the Army officers who were in actual control. Similarly, the recommendations relating to the Navy reflected Navy proposals. The Board, however, afforded a valuable opportunity for the interchange of opinion and the unification of effort.

Aircraft Board

The Aircraft Board, superseding the former organization, was established by the Act of Oct. 1, 1917. This was composed of nine members, including the Chief Signal Officer (Major-General Squier) and two other representatives of the Army, and the Chief Constructor of the Navy (Rear Admiral Irwin) and two other naval officers. For the Army, the Secretary of War designated Colonel Deeds and Colonel Montgomery; and for the Navy, the Secretary of the Navy designated Captain N. E. Irwin and Lieut.-Com. A. K. Atkins. The civilian members, appointed by the President with the advice and consent of the Senate, were Mr. Coffin (Chairman), Richard F. Howe (who had been connected with the International Harvester Company) and Harry B. Thayer (President of the Western Electric Company),—the last-named being appointed in February, 1918.

The Act creating the Aircraft Board empowered it under the direction and control of the Secretary of War and the Secretary of the Navy.

to supervise and direct, in accordance with the requirements prescribed or approved by the respective departments, the purchase, production, and manufacture of aircraft, engines and all ordnance and instruments used in connection therewith, and accessories and materials therefor, including the purchase, lease, acquisition or construction of plants for the manufacture of aircraft, engines and accessories; provided, that the Board may make recommendations as to contracts and their distribution in connection with the foregoing, but every contract shall be made by the already constituted authorities of the respective departments.

It was also provided that

except upon the joint and concurrent approval of the Secretary of War and the Secretary of the Navy there shall not be established or maintained under the Board any office or organization duplicating or replacing, in whole or in part, any office or organization now existing that can be properly established or maintained by appropriations made for or available for the military or naval service.

In February, 1918, Acting Judge Advocate General S. T. Ansell gave an opinion to the effect that the provisions of the Act should be construed to contemplate "only advisory or recommendatory functions". Thereupon, the Chief Signal Officer, in an order approved by the Secretary of War and the Sec-

retary of the Navy, defined the duties of the Aircraft Board as follows:

- a. To act as a clearing house between the General Staff and the Signal Corps for all matters pertaining to raw materials for foreign governments for the production of aircraft, the Equipment Division of the Signal Corps to act as purchasing agency.
- b. To act as a clearing house between the General Staff and the Signal Corps for all information in relation to requirements of foreign governments for aircraft to be manufactured in the United States.
- c. To act as a clearing house for all information as to requirements as between the army and navy for aircraft and raw materials.
- d. To study the requirements of the army and navy as regards combat and training planes. To study types with the Technical Divisions of the army and navy to the end that recommendations be made that given types be placed with industrial plants best fitted to undertake their manufacture. The Aircraft Board shall have no direct communication with manufacturing plants, except through the medium of the procurement divisions.
- e. As a result of above studies the Aircraft Board may recommend that preparations be made for production before actual contracts are made.
- f. To recommend the placing of experimental contract.
- g. All programs should be made up by the Board from information which shall be furnished by the proper army and navy military and naval branches, on the one hand, and the Equipment and Production Divisions of the army and navy on the other. All foreign cables respecting aircraft production should be cleared through the Board.
- h. The Aircraft Board should be the instrumentality through which contact is made on matters of large policy with other bodies such as Shipping Board, Allied representatives, etc.

Despite the broad language of the Act of Congress as to the power which might be committed to the Board under the direction of the Secretary of War and the Secretary of the Navy, it will be observed that this executive order had the effect of greatly limiting the authority of the Board and that it was denied even the right to hold "direct communication with manufacturing plants". It was further provided that all programs should be made up by the Board "from information which shall be furnished by the proper Army and Navy Military and Naval Branches on the one hand and the Equipment and Production Divisions of the Army and Navy on the other". The manifest purpose was to leave no question that the actual control of aircraft production rested with the Military and Naval officers.

The Aircraft Board held frequent sessions, and continuously made recommendations upon which action was taken and contracts placed, the service of the Board being virtually that of a clearing house for proposals which generally emanated from the responsible authorities and in all cases were dependent upon the action of these authorities for their final approval and execution.

THIRD. PERSONAL INTERESTS

There are no common law offenses against the United States, and a charge of crime under Federal law must rest exclusively upon the violation of a Federal criminal statute (United States vs. Eaton, 144 U. S. 677, 687; United States vs. George, 228 U. S. 422).

The applicable statutes of the United States, dealing with the question of personal interest of officers and agents of the Government in Government contracts are the following:

(1) Section 41 of the Criminal Code of the United States, formerly Section 1783 of the Revised Statutes, provides:

Sec. 41. No officer or agent of any corporation, joint stock company or association and no member or agent of any firm or person directly or indirectly interested in the pecuniary profits or contracts of such corporation, joint stock company, association, or firm shall be employed or shall act as an officer or agent of the United States for the transaction of business with such corporation, joint stock company, association, or firm. Whoever shall violate the provision of this section shall be fined not more than two thousand dollars and imprisoned not more than two years.

Under this statute, it is not enough that an interested person merely recommends or advises transactions with the Government. To constitute a violation of the statute, the interested person must "be employed" or "act as an officer or agent of the United States for the transaction of business with such corporations," etc.

(2) Section 3 of the Act of Aug. 10, 1917 (Food and Fuel Control Act) provides:

Sec. 3. That no person acting either as a voluntary or paid agent or employee of the United States in any capacity, including an advisory capacity, shall solicit, induce, or attempt to induce any person or officer authorized to execute or to direct the execution of contracts on behalf of the United States to make any contract or give any order for the furnishing to the United States of work, labor, or services, or of materials, supplies, or other property of any kind or character, if such agent or employee has any pecuniary interest in such contract or order, or if he or any firm of which he is a member, or corporation, joint-stock company, or association of which he is an officer or stockholder, or in the pecuniary profits of which he is directly or indirectly interested, shall be a party thereto. Nor shall any agent or employee make, or permit any committee or other body of which he is a member to make, or participate in making any recommendation concerning such contract or order to any council, board, or commission of the United States, or any member or subordinate thereof, without making to the best of

his knowledge and belief a full and complete disclosure in writing to such council, board, commission, or subordinate of any and every pecuniary interest which he may have in such contract or order and of his interest in any firm, corporation, company, or association being a party thereto. Nor shall he participate in the awarding of such contract or giving such order. Any willful violation of any of the provisions of this section shall be punishable by a fine of not more than \$10,000, or by imprisonment of not more than five years, or both; *Provided*, That the provisions of this section shall not change, alter or repeal section forty-one of chapter three hundred and twenty-one, Thirty-fifth Statutes at Large.

This section covers those who act in an advisory capacity. It has no application to transactions occurring before its passage.

It is apparent that the section was guardedly drawn and its limitations should be noted. The first sentence of the section applies to interested persons only where they "solicit, induce, or attempt to induce" any person or officer, who is "authorized to execute, or to direct the execution of contracts," to make any contract or give any order for labor, services, materials, etc. The use of different expressions in the different clauses of the section suggests possible shades of meaning. The act of recommending does not come within the first sentence unless it is found to amount to "soliciting," "inducing" or "attempting to induce," nor does the first sentence cover solicitations addressed to others than the persons or officers duly authorized to make the contracts or give the orders.

The second sentence relates to "recommendations" by interested persons, but it is limited to recommendations made "to any council, board, or commission of the United States, or any member or subordinate thereof" in the absence of the disclosure described. Apparently this sentence does not cover recommendations made to individual officers acting under the authority conferred upon them by law, who are not members or subordinates of a "council, board, or commission."

The third sentence provides that the interested person shall not "participate in the awarding of such contract or giving such order." This would seem to relate to those who take part in the actual awarding of the contract or giving of the order and not to those who act in an advisory capacity only.

The section concludes with the proviso that its provisions shall not alter or repeal Section 41 of the Criminal Code above quoted.

To come within these statutes an interested person must either (1) act as an officer or agent of the Government for the transaction of business with the concern in which he is interested, or (2) solicit, induce or attempt to induce the person or officer, who is authorized to execute or direct the execution of contracts, to make a contract with or give an order to, the concern to which the interest relates, or (3) take part in a recommendation to a "council, board, or commission" or subordinate or members thereof, without the disclosure stated, or (4) participate in the award of the contract or giving of the order.

In connection with these statutes attention may be called to the following provision, which appears as a rider in the Appropriation Act of March 3, 1917, immediately following an appropriation for the distribution of documents (39 Stat. p. 1106):

Provided, That on and after July 1, 1919, no government official or employee shall receive any salary in connection with his services as such an official or employee from any source other than the Government of the United States, except as may be contributed out of the Treasury of any State, county or municipality, and no person, association or corporation shall make any contribution to, or in any way supplement the salary of, any government official or employee for the services performed by him for the Government of the United States. Any person violating any of the terms of this proviso shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine of not less than \$1000 or imprisonment for not less than six months, or by both such fine and imprisonment as the court may determine.

It will be noted that this provision, enacted in March, 1917, is not to be operative until July 1, 1919. It may be contended with force that this constitutes a legislative declaration, by implication, that the action described by the provision, that is, the mere supplementing of the pay of Government officials by private contributions, should not be deemed contrary to law prior to the date fixed.

INDIVIDUAL RELATIONS OF OFFICIALS

Present Bureau of Aircraft Production

John D. Ryan—William C. Potter

There is no suggestion, and no evidence, that either Mr. Ryan or Mr. Potter has taken any part in Government transactions with any concern in which he has a personal interest.

Members of the Aircraft Board

The relations of the members of this board, who received commissions in the army are stated hereafter. As to Mr.

Coffin, and as to the naval officers who were members of this board, it should be said that there is no evidence that any one of them has taken any part in transactions or recommendations relating to any corporation, firm or association in which he has an interest. Disclosures of interest in particular corporations have been made from time to time by Mr. Howe and Mr. Thayer and with respect to such corporations it appears that they have abstained from participating in the recommendations made by the board; except that Mr. Howe in his disclosure of interest to the board on Feb. 12, 1918, stated that he was interested in a corporation holding preferred stock of the Willys-Overland Co., and that he was present at the meetings of the board on Dec. 7 and Dec. 18, when resolutions involving a contract with that company were passed, but that he was not aware of such financial interest at those times. As the board acts in an advisory capacity simply, Sec. 41 of the Criminal Code cannot be regarded as applicable, and the limitation of Section 3 of the Act of Aug. 10, 1917, with respect to mere recommendations, have already been pointed out.

Officers of the Signal Corps Formerly in Control of Aircraft Production

(1) The Chief Signal Officer

It does not appear that General Squier had any interest in any corporations or concerns transacting business with the Signal Corps. The defects in the organization, which was created under his direction for the purpose of aircraft production, are matters distinct from any question of personal interest and will be considered in another division of this report.

(2) Colonel Edward A. Deeds

The charges pertaining to personal interest in Government contracts relate particularly to Colonel Edward A. Deeds and grow out of the highly suggestive transactions with his former business associates at Dayton. These transactions have been subjected to careful scrutiny.

Colonel Deeds was born near Granville, Ohio, on March 12, 1874. There is testimony that he once said that his name originally was "Dietz." No public record has been found to this effect. Colonel Deeds denies making the remark attributed to him and states that his family has borne the name of Deeds for at least four generations—his great-grandfather of that name coming from Pennsylvania.

For many years Colonel Deeds was an officer of the National Cash Register Co., and was one of several connected with that organization who were indicted in the Federal District Court for the Southern District of Ohio in 1912, for violation of the Sherman Anti-Trust Act. Upon the trial, Deeds, with other defendants, was convicted, but this conviction was set aside by the Circuit Court of Appeals (*Patterson v. United States*, 222 Fed. 599) and the prosecution went no further.

At the time of our entry into the war Mr. Deeds had large business interests at Dayton. His intimate business associates were Charles F. Kettering and H. E. Talbott. Mr. Deeds and Mr. Kettering (an inventor and engineer of ability) have been jointly associated in many enterprises with equal shares, it being their policy to organize corporations and to take their respective interests in stocks.

Mr. Deeds has supplied the financial talent and Mr. Kettering, who is without any aptitude for business details, the engineering skill. They have had, and still have, a common agent of a highly confidential sort, George B. Smith of Dayton, who holds the power of attorney of each, keeps their respective books, has charge of their bank accounts, signs their checks and generally looks after their financial affairs. They are still associated in various undertakings, and their relations are of the most intimate character.

In 1904 Kettering was employed in the National Cash Register Co. as a designer in the engineering department, and later he became associated with Deeds in the development of what is known as the Delco ignition system for automobiles. In the course of this development Deeds and Kettering organized the Dayton Engineering Laboratories Co., known as the Delco company. The enterprise was successful and the common stock was sold by Deeds and Kettering in 1916 to the United Motors Corp. for several million dollars in cash and certain shares of stock. Deeds and Kettering each retained a few shares of preferred stock; Deeds continued as president of the corporation, with a salary of \$60,000 a year, and Kettering as vice-president with a salary of \$50,000.

In April, 1915, Deeds, Kettering, H. E. Talbott, Sr., and his son, H. E. Talbott, Jr., organized the Dayton Metal Products Co. with a capital stock of \$200,000. The stock was held as follows: Talbott, Sr., 900 shares; Deeds, 500

shares; Kettering, 499 shares; Talbott, Jr., 99 shares; Charles H. Mead, 1 share, and George B. McCann, 1 share.

Prior to our entry into the war, this company had profitable fuse contracts with the British Government and had accumulated a considerable surplus. It appears that in the spring of 1917 both Deeds and Talbott were appointed on the Sub-Committee on Fuses and Detonators of the Munitions Standards Board. In 1916 the company had a contract with the Navy Department for fuses, and it received other fuse contracts from the Navy and the Ordnance Department of the Army in 1917.

As vice-president of this company Deeds had a salary of \$25,000 a year. The relation of the Dayton Metal Products Co. to aircraft production is that this company, in the latter part of the year 1917, acquired all the stock (save four qualifying shares) of the Dayton Wright Airplane Co., and also has sub-contracts for metal parts with contractors making airplanes and engines. The Dayton Metal Products Co. also subscribed and paid for 1000 shares (par value \$100,000) of the stock of the Lincoln Motor Co., which was organized to build Liberty engines, and has a paid-up capital stock of \$850,000.

In September, 1916, Deeds and Kettering organized the Domestic Building Co. of Dayton, for the purpose of erecting and financing plants for the use of various companies. The capital stock is now \$1,000,000, of which all but four qualifying shares are held by Deeds and Kettering in equal parts. This company owned the land and erected the building acquired by the Dayton Wright Airplane Co. for its principal airplane plant.

On April 9, 1917, the Dayton Wright Airplane Co. was incorporated with a capital stock of \$500,000 by Deeds, Kettering, H. E. Talbott and H. E. Talbott, Jr., in conjunction with Orville Wright. They had taken over the former Wright organization and thus had started an airplane enterprise at Dayton in a small way in the summer of 1916.

The larger enterprise of the Dayton Wright Airplane Co. was launched about the time of our entry into the war, manifestly with the expectation of obtaining Government contracts. While Deeds was one of the incorporators, he did not become a stockholder, the subscriptions for the first 5000 shares being as follows: H. E. Talbott 1990 shares, C. F. Kettering 2000 shares, H. E. Talbott, Jr., 990 shares, George H. Mead 10 shares, and C. A. Craighead 10 shares. In August, 1917, the capital stock was increased to \$1,000,000 (\$600,000 common and \$400,000 preferred).

The new common stock was taken by Messrs. Talbotts and Kettering in the proportion of two-fifths, two-fifths and one-fifth. There were early negotiations for a Government contract and as early as June 12, 1917, a contract with the company was recommended by the Aircraft Production Board. The contract was executed on Aug. 17, 1917 (under date of Aug. 1, 1917) and was for 400 Standard J-1 training planes at the fixed price of \$6,500 each.

For this, there was substituted the contract dated Sept. 7, 1917, which was also recommended by the Aircraft Production Board and was approved by General Squier. This contract was for 400 Standard-J airplanes, 2000 DeHaviland-9s and 1500 Martinsydes with spare parts. By later modifications the Martinsydes and DeHaviland-9s were omitted and provision was made for 4000 DeHaviland-4s.

These contracts were on a cost-plus basis, the estimated amount involved being upward of \$30,000,000. There was to be a fixed profit of \$620 on each Standard-J plane and \$875 on each DeHaviland, making a total fixed profit of about \$3,750,000, exclusive of fixed profit on spare parts covered by the contract, thus expected to be earned, according to the contemplated deliveries, before the end of 1918.

The contract also provided for additional profits to the extent of 25 per cent of the saving under the bogey or estimated cost of the planes (\$7,000 on the DeHavilands) and it is estimated that the additional profit on this basis would have amounted to over \$2,600,000. When the bogey cost of \$7,000 was fixed, letters were obtained from the Dayton Wright Airplane Co., and from the Fisher Body Corp. (which also had a contract for DeHavilands), that after 250 machines had been produced there would be an equitable adjustment if the bogey cost was found to be "materially wrong." Accordingly, a contract is now about to be signed reducing the bogey cost to \$5,000 and the fixed profit to \$625 per plane.

Even at this rate, the fixed profit on the 4000 DeHavilands will be \$2,500,000, and it is believed that there will be an additional profit through saving under the bogey cost, and on spare parts, of not less than \$1,000,000.

In August and September, 1917, when the first Government contracts were awarded, the capital stock of the company (\$1,000,000) had not been paid in. It was not paid in until Dec. 1, 1917, when, in one transaction, the stock was paid for

and all the shares, preferred and common, save five qualifying shares were transferred to the Dayton Metal Products Co., which thus became and still remains the owner of the Dayton Wright Airplane Co.

As the latter company practically received nothing on the issue of its capital stock save the fixed property represented by its plants, it was lacking in working capital and this at the outset was supplied by various loans and advances of the interested parties. In December the Government agreed to advance the company \$2,500,000, of which \$1,500,000 was advanced at once.

The name of Orville Wright was used in this enterprise, but his chief activity has been as a consulting engineer in connection with experimental work. He has not been responsible for production. Mr. Kettering is an engineer of ability, but his work also has been that of experimental engineering; he is not a manufacturing or production expert.

Much emphasis is placed by the parties concerned upon the fact that they were able to avail themselves of the old Wright organization which had been continued as already stated. But this was a very slender basis for the prompt selection of this newly-organized company, which had not even completed its financial arrangements, as one of the few companies immediately admitted to the advantages of large and highly profitable Government contracts.

The promoters of this enterprise, not content with these profits which were to accrue to them either directly or through their ownership of the Dayton Metal Products Co. at once took advantage of the opportunity to increase their gains by salaries as executive officers of the Dayton Wright Airplane Company. Dating from Aug. 1, 1917, the salaries thus allowed were as follows: H. E. Talbott, Sr., \$35,000; C. F. Kettering, \$35,000, and H. E. Talbott, Jr. (thirty years old, who was made president of the company), \$30,000. Talbott, Sr., was at the time receiving, and continued to receive, \$60,000 a year as president of the Dayton Metal Products Co., Kettering received a salary of \$25,000 from the Dayton Metal Products Co. and \$50,000 from the Delco Co.; and Talbott, Jr. was also receiving a salary of \$18,000 from the Dayton Metal Products Co.

There would seem to be no question but that the members of the Aircraft Production Board in recommending contracts had confidence in the capacity of those undertaking the venture, and the previous success of this group, while Mr. Deeds had been associated with them, was well known.

But the fact remains that practically at the inception of the Government's aviation activity in connection with the War, and within the sphere of Colonel Deeds' important if not commanding influence, his former business associates were placed at once through Government contracts in a position where they had the assurance of very large profits upon a relatively small investment of their own money and in addition were able to secure generous salaries which they charged against the Government as part of the cost of manufacture.

That Deeds, Kettering and Talbott continued to be on the most intimate and confidential footing in connection with the prosecution of the Government work by the Dayton Wright Airplane Company is apparent from their correspondence, of which the following are excerpts:

Letter Deeds to Kettering, June 13, 1917:

Mr. C. F. Kettering,
City National Bank Bldg.,
Dayton, Ohio.

Washington, June 13, 1917.

My dear C. F.:

You will be interested to know that the standard training machine is going to be called the U. S. primary training and will not be called the Curtiss J.N. This was decided last week and I forgot to tell you when in Dayton.

Provision will be made for either Mr. Coffin or myself to appear before the S. A. E., and as I am one of the Committee on Arrangements will see that the plans of the Aircraft Production Board get properly before the Association.

Relative to the design of planes, I do not care to write what is being done but will discuss it with you when I get home and you will see that we have already gone away down the pike in this matter. Everything is filling up now in pretty good shape.

Yours very truly,

E. A.

*Society of Automotive engineers.

Telegram Deeds to Talbott, July 3, 1917:

Mr. H. E. Talbott,
Dayton, Ohio.

July 3, 1917.

General Squier went direct to Detroit. Will probably spend fourth at his old home in Michigan. May be in Dayton Thursday or Friday, arriving there from Detroit or from Champagne, Illinois. Harold, Kettering and Wright can take care of him. He will be interested in the Dayton Wright factory and laboratory, Orville Wright laboratory and especially Mr. Kettering's views on scientific subjects. In general he is highly technical.

E. A. Deeds.

Telegram Kettering to Deeds, August 4, 1917:

E. A. Deeds,
Room 527, Munsey Building,
Washington, D. C.

Dayton, Ohio, August 4, 1917.

We believe all confidential telegrams should be sent to Mr. H. E.

Talbott, Sr., City National Bank Building, or George B. Smith, instead of the Dayton Wright Airplane Company.
C. F. Kettering.

Telegram Deeds to Kettering, August 4, 1917:

August 4, 1917.
Mr. C. F. Kettering,
City National Bank Building,
Dayton, Ohio.
Hereafter all confidential telegrams will be sent to H. E. Talbott, Sr., instead of to the Dayton Wright Airplane Company.
E. A. Deeds.

Telegram Deeds to Talbott, September 16, 1917:

Old Point, Virginia, Sept. 16, 1917.
H. E. Talbott,
Dayton, Ohio.
For your personal information as coming from your local attorney. Judge Advocate General has ruled it legal for government to select one, contractor one and the two a third, as appraisers of market value of plant at expiration of contract. If you care to raise the question the above will be found to be the final ruling.
E. A. Deeds.

When this last telegram, which puts in a strong light the relations of the parties, was sent, Deeds was an officer in the Army. This highly improper conduct, in holding communication in this manner with his former business associate in a transaction pending between the Dayton Wright Company and the Government Department in Colonel Deeds' charge, demands the attention of the military authorities.

But evidence of favoritism, influence, or confidential communications of this sort, however otherwise reprehensible, do not make out criminal liability under the statutes above quoted, unless it appears that the representative of the Government has a pecuniary interest in the Government contract or order, or is an officer or stockholder of, or has a pecuniary interest in, a corporation, firm or association which is a party to the Government contract or order. And the question is whether Colonel Deeds had such an interest. His statement is that he had no such interest but on the contrary had given up large salaries to devote himself to the Government service.

About the time he received his commission as Colonel in the Army, Mr. Deeds addressed the following communications to the Secretary of War and to the Aircraft Production Board, under date of August 28, 1917:

Washington, D. C., Aug. 28, 1917.
Hon. Newton D. Baker,
Secretary of War,
Washington, D. C.
Dear Sir:

You have honored me by appointment temporarily as an officer in the Regular Army of the United States, and as a member of the Aircraft Production Board connected with your Department. It is possible that this Board in the development of the airplane work may wish to recommend a contract with some of the corporations in which I have had an interest. Following the advice of counsel, I have resigned my official relations with these corporations, and made bona fide transfers of my stock therein to other parties.

For your protection as well as my own, I desire to file with your Department a copy of a written disclosure of my relations, both past and present, to these corporations which I have this day filed with the Aircraft Production Board, and I enclose same herewith.

In serving in the positions to which you have appointed me, I desire to comply with both the spirit and letter of the law, and to do no act which might invite criticism upon myself or your Department.

I count it an honor and privilege to be thus called into the service of our country and am pleased to make whatever sacrifice of time and money that service may demand.

I enclose a second copy of my statement to be filed with you as Chairman of the Council of National Defense.

Yours very respectfully,

(Signed) E. A. Deeds.
Washington, D. C.,
August 28, 1917.

The Aircraft Production Board,
Washington, D. C.
Gentlemen:

As a member of your Board and interested in the letting of contracts on the recommendation of that Board on behalf of the Government, I desire at this time to make a full and complete disclosure of the interest I may have in any corporation which might be a party to any such contract, or which might furnish supplies to the Government through the instrumentalities of your Board.

I was a stockholder and officer in the following, to wit:

- (1) The United Motors Company of New York, being a union of several companies manufacturing automobile parts.
- (2) The Dayton Engineering Laboratories Company, of Dayton, Ohio, manufacturers of ignition and starting devices for automobiles.
- (3) The Dayton Metal Products Company, of Dayton, Ohio, engaged among other things in the manufacture of munitions.
- (4) The Domestic Building Company, of Dayton, Ohio, a corporation formed for the development of real estate and which now owns the land and buildings leased to The Dayton Wright Airplane Company.

In all of the foregoing corporations I have severed my official connection therewith by resignation and have made a bona fide transfer to other parties of all my stock therein.

In addition to the above corporations, I was an incorporator of The Dayton Wright Airplane Company, but never owned any stock therein. I am also the president of and a large stockholder in The Domestic Engineering Company, of Dayton, Ohio, makers of Delco Light Plants, and expect to retain my official connection therewith and my financial interest therein.

I also own the ground embraced in The Moraine Experimental

Flying Field near Dayton, Ohio, used for aviation purposes but out of which I receive no compensation.

I make this disclosure now so that your Board, as the representative of the Government, may be fully informed as to my relations, past and present, with these corporations, and be thus enabled to act wisely on any order or contract involving any of these corporations either directly or indirectly. I desire that this written disclosure be recorded in the minutes of your Board for the mutual protection of all of us.

Yours very respectfully,
(Signed) E. A. Deeds.

The facts with respect to the disposition of Colonel Deeds' interests (so far as pertinent to this inquiry), and the method of disposition, are as follows:

United Motors Corp.

Dayton Engineering Laboratories Co.

The significance of Colonel Deeds' statement with respect to the disposition of his interests in these corporations is that the Delco ignition system is used in the airplane engine known as the Liberty motor. In the planes manufactured abroad, the magneto ignition system had been used and prior to its use on the Liberty motor, it appears that the Delco system had not been employed on an airplane engine. In the specifications for the Liberty motor, the Delco system was required to be installed with the first 20,000 engines. As already stated, the Delco system is controlled by the Dayton Engineering Laboratories Co. (Delco company) and this company is owned by the United Motors Corp.

On the sale of his Delco stock to the United Motors Corp., Deeds had received in addition to cash, 30,000 shares (no par value) of its stock. [The total issued stock amounted to 1,200,000 shares.] After certain distributions, he still held at the time in question, 17,500 of these shares. He also had an interest in a pool of certain shares, on which 3880 additional shares were received in November, 1917.

In his letter (above quoted) to the Aircraft Production Board, Deeds stated that he had severed his official connection with the United Motors Corp. and had made a bona fide transfer of his shares. He had resigned as Vice-President and director on Aug. 16, 1917.

The only transfer made by him of any of his shares in that company was by gift to his wife. He endorsed, for transfer, the certificates for 17,500 shares on October 13, 1917, and they were transferred to Mrs. Deeds' name on October 17, 1917.

Thereafter, it is testified, they were held by the confidential agent, George B. Smith, for her account. Entries of the transfer were made in Colonel Deeds' books by Smith not earlier than October, 1917, and were dated back to August 28, 1917. In the earlier statement of his assets on August 31, 1917, submitted to him by Smith, the shares appear as part of his property. Mrs. Deeds' name first appears in the statement of assets of October 31, 1917. The remaining shares (3880) received on the dissolution of the pool about November 22, 1917, were transferred from the pool manager directly to Mrs. Deeds, as Mr. Deeds' donee, and the certificates were received by Smith on her behalf. Prior to the transfer of the stock in October and at the time of Colonel Deeds' letter to the Aircraft Production Board, he had simply told his wife that it was to be her stock, and it does not appear that there had been an effective gift of the shares. The actual value of the 21,380 shares was approximately \$500,000.

In addition to these shares in the United Motors Corp., Deeds also held 38 shares of Delco preferred stock, which he had retained at the time of the sale of his common stock. These preferred shares he transferred to Kettering. It appears that the transfer was first entered by Smith in Colonel Deeds' private journal in December, 1917.

The date of the entry was afterwards changed to August 28, 1917, to correspond to the date when Smith was notified that Colonel Deeds had received his commission in the Army. The stock was transferred to Kettering on the books of the company on October 13, 1917. The payment was made by debits in Deeds' open account with Kettering.

If there were evidence that Colonel Deeds had acted as officer or agent of the Government in the transactions with the Delco Company, or with the United Motors Corp., prior to October 13, 1917, there would be ground by reason of his interest for charging a violation of the statute, and it may be doubted whether there was then or thereafter such a transfer as would avail to take the case out of the statutory prohibition.

But there is no evidence that Deeds acted for the Government in any transaction with either of these corporations. So far as appears, the Government made no contracts for Delco ignition either with the Delco company or with the United Motors Corp.

The contracts for the Delco system were made by the contractors who were manufacturing the engines under contracts

with the Government, and the dealings with the Delco company or with the United Motors Corp. in relation to the Delco system were had by these contractors.

It must also be said that, despite the natural inference from former business association and interests, the proof is lacking that the selection of the Delco system was due to the solicitation of Deeds. It can hardly be questioned that the design of the Liberty motor contemplated the use of the Delco system, and that the magneto system could be used only by a special adaptation.

The Delco system, however, had been extensively used for automobiles, notably by the Cadillac and Packard companies, and was in high favor with those who were developing the Liberty motor. While there has been a question as to which system was preferable, and it has been understood that foreign representatives at first did not approve the departure from foreign practice, and many may still be found to disapprove it, there is considerable evidence that the use of Delco ignition has been growing in favor, and there has been testimony in this investigation from impartial and competent sources commending its adoption.

Special attention has been given to the memorandum directing the use of the Delco system in the first 20,000 Liberty motors. In the first memorandum by Major Gray, Chief of the Specification Section, under date of October 6, 1916, the accessories recommended were so placed that the Delco ignition came last on the list. This was then rearranged, apparently to attract less attention to Delco in alphabetical order.

The recommendation, Major Gray testifies, for the use of the Delco system and the other accessories specified came from Major Vincent, one of the designers of the Liberty motor and then executive officer of the Airplane Experimental Department of the Equipment Division, who stated that he did not believe they would be justified "in specifying for quantity production any other accessories than those which had thus far been tested out satisfactorily."

The situation was a delicate one, says Major Gray, as Major Gray himself had been president of the Hess Bright Company (he had resigned his office and disposed of his holdings in June, 1917), whose ball-bearings were required as one of the accessories, and Colonel Deeds had developed the Delco system. Major Gray testifies that he brought the question to Colonel Deeds' attention, who said, "I do not like really to have anything to say about it, because in that list is the Delco ignition and if I authorize it it will look as though I have an axe to grind." The sum of the matter is that there is no satisfactory evidence that Colonel Deeds signed, prepared or directed the order for the use of the Delco ignition although it cannot be doubted that he desired the system to be used. Nor is there evidence that any recommendation was made by Colonel Deeds to the Aircraft Board or to any other council, board or commission regarding the matter.

His statement to the Aircraft Production Board on Aug. 28, 1917, that he had made a *bona fide* transfer of all his stock in the United Motors Corporation, when the stock had not in fact been transferred and at most he contemplated a gift of the stock to his wife, was neither candid nor truthful, and is certainly not to be regarded as a "full and complete disclosure." But in the absence of proof of solicitation, inducement or recommendation by him, or action on his part as an officer or agent of the Government in transactions with the United Motors Corp. or the Delco company, there are no facts bringing the case within the statutory prohibition.

Domestic Building Co.

In his letter of Aug. 28, 1917, to the Aircraft Production Board, Colonel Deeds stated that he had made a *bona fide* transfer of his stock in this company. This was not true. It appears that on that date he resigned the office of president of the company, but he did not dispose of his stock. The stock of that company is still held in equal portions by Deeds and Kettering.

Colonel Deeds was plainly led to make the statement in his letter by the fact that the Domestic Building Co. had acquired the land and had erected the building which was in course of completion, and was then occupied and intended to be used as the principal plant of the Dayton Wright Airplane Co. for the manufacture of airplanes.

It is said that in anticipation of a lease of the property to the Dayton Wright Airplane Co., it had been agreed prior to Aug. 28, 1917, that Deeds' stock in the Domestic Building Co. should be sold to Kettering.

But there is not sufficient evidence of a definite and binding agreement to that effect, or of anything more than a loose understanding between intimates, whose arrangements could at any time be adjusted to suit their mutual convenience.

Certainly, there had been no transfer of the stock. It was

not until November that there was an adjustment of accounts with this company, and then, instead of a sale of his stock by Deeds, he retained his stock in the Domestic Building Co. and the plant erected by that company was purchased by Talbott, Sr., Kettering and Talbott, Jr., who at once transferred it to the Dayton Wright Airplane Co.

On Feb. 4, 1918, the Domestic Building Co. made a direct conveyance to the Dayton Wright Airplane Co. of an additional tract of 8.34 acres, adjoining the first tract, at the price of \$13,344, or \$1,600 per acre.

However, there is no ground, so far as the retention of Deeds' stock interest in the Domestic Building Co. is concerned, for charging a violation of statute. It is not enough that the Dayton Wright Airplane Co. purchased these properties, or that certain advances by Deeds were taken into account in fixing the purchase price of the main plant, or that both parcels of land were sold at more than the amount they had cost the Domestic Building Co.

The Government has never had any contracts with the Domestic Building Co. and it does not appear that Colonel Deeds has acted as an officer or agent of the Government in any transactions between the Government and that company. The gratuitous statement contained in his letter to the Aircraft Production Board that he had made a transfer of all his stock in this company may be said to indicate a willingness to state, as an accomplished fact, a transaction which never took place but was merely in contemplation as a step to be taken if deemed to be necessary.

Dayton Wright Airplane Company.

Colonel Deeds' statement in his letter of August 28, 1917, that he had never been a stockholder in this company was true. The stock is owned by the Dayton Metal Products Co., and if Colonel Deeds had or has any interest through stock ownership in the profits on its contracts with the Government, this interest must be derived from an interest in the stock of the Dayton Metal Products Co.

His relation to the organization of the Dayton Wright Airplane Company is this: He was an incorporator, and while he did not subscribe for stock, and none was issued in his name, the payment of the stock of the company to the extent of upwards of four-fifths of its par value was made, in substance, by the transfer to the company of the plant built by the Domestic Building Co., owned by Deeds and Kettering, and this company received therefor unsecured notes of Talbott, Sr., Kettering and Talbott, Jr., only a small part of which has been paid. Thus, Deeds and Kettering through the Domestic Building Co., virtually furnished the main plant of the Dayton Wright Airplane Co., on a credit to the Talbotts and Kettering. The transaction was as follows:

The airplane factory was erected on a tract which the Domestic Building Company had acquired from the Moraine Development Company (a corporation in which Deeds and Kettering were largely interested) at a price a little over \$753 an acre. The building was intended for the use of the Domestic Engineering Company, another concern owned by Deeds and Kettering, which was engaged in the business of supplying Delco lights for general illuminating purposes.

It was later decided that it should be used by the Dayton Wright Airplane Co., which entered into possession. Still later, it was arranged that the syndicate composed of Talbott, Sr., Kettering and Talbott, Jr., should purchase the plant from the Domestic Building Company and convey it to the Dayton Wright Airplane Co.

In November, 1917 (while the building was still incomplete), Mr. Allan R. Smart, a public accountant (of Barrow, Wade, Guthrie & Company) made an adjustment of the accounts of Deeds, Kettering, Talbott, Sr., and Talbott, Jr., for various advances and a balance was struck of \$683,732.16 as owing to the Domestic Building Company.

In this adjustment, the land (25.55 acres) was taken at \$1200 an acre and the building at the amount of the expenditures upon it, making the price of the plant (called the Moraine plant) \$836,401.08. The balance of \$683,732.16 was covered by three individual notes of Talbott, Sr., Kettering and Talbott, Jr., in the proportion of two-fifths, two-fifths and one-fifth, as follows: H. E. Talbott, \$273,492.87, C. F. Kettering \$273,492.87, and H. E. Talbott, Jr., \$136,748.43.

All of the notes were dated November 4, 1917, and were payable to the Domestic Building Company one year after date with 6 per cent interest. The notes are unsecured. The makers of the notes have paid interest quarterly; and, in addition, Talbott, Sr., has paid \$3,492.87 on the principal of his note, reducing it to \$270,000, and Talbott, Jr., has paid \$26,746.43 on the principal of his note, reducing it to \$110,000.

It appears that Mr. Kettering has made payments of

\$6,000. This transaction left the Talbotts and Kettering as the owners of the Moraine plant, which the Dayton Wright Airplane Company was operating, and the stock of the Dayton Wright Airplane Company for which they had subscribed had not been paid in.

The payment of the subscriptions for the stock of the Dayton Wright Airplane Co., the concurrent payment by that company for two plants (the Moraine plant, already mentioned, and another at Miamisburg), and the transfer of its stock, thus paid for, to the Dayton Metal Products Co., were effected by an exchange of checks on Dec. 1, 1917.

Shortly before, the Miamisburg plant had been acquired by Talbott, Sr. (for the syndicate), for the sum of \$60,000 and was turned over to the Dayton Wright Airplane Co., at \$127,202, the profit being divided between himself, Kettering and Talbott, Jr., according to their respective interests in the syndicate. To accomplish the desired result, the following procedure was adopted:

The Dayton Wright Airplane Co., gave to the syndicate its check for the sum of \$955,071.25, made up of the purchase price of the Moraine and Miamisburg plants (\$836,401.08 less an item of interest (\$8,531.83) for the Moraine or main plant and \$127,202 for the Miamisburg plant).

The Dayton Metal Products Co., gave its checks to the syndicate for \$183,459.55, for various balances of accounts and for \$999,500, the purchase price at par of the stock of the Dayton Wright Airplane Co. (less five shares retained). The syndicate thus received checks to the aggregate amount of \$2,138,030.80.

The syndicate gave their check to the Dayton Wright Airplane Co., in payment of the capital stock of \$1,000,000 and another check to the Dayton Metal Products Co., for \$1,136,537.20 as the purchase price of certain securities which the Dayton Metal Products Co. sold to the syndicate, making the total of the syndicate's checks \$2,136,537.20.

The Dayton Wright Airplane Co. gave its check to the Dayton Metal Products Co., in re-payment of advances for \$44,928.75, the difference between the sum of \$955,071.25 paid by the company for the plants and the sum of \$1,000,000 received for its stock.

The transaction was accomplished with a minimum use of cash (less than \$1,500), and as a result the Dayton Metal Products Co., had all the stock (save five shares) of the Dayton Wright Airplane Co.; the Dayton Wright Airplane Co., had the Moraine and the Miamisburg plants; Messrs. Talbotts and Kettering had the securities which they had purchased from the Dayton Metal Products Co.; and the Domestic Building Co. (owned by Deeds and Kettering) continued to hold the notes which the Talbotts and Kettering had given to that company on the settlement in November.

In the transfer by the syndicate of the shares of the Dayton Wright Airplane Co. to the Dayton Metal Products Co., it was agreed that all dividends in excess of 7 per cent. per annum on the transferred stock, and in excess of 8 per cent. per annum on the common stock, should be paid to Talbott, Sr., Kettering and Talbott, Jr., in the proportion of two-fifths, two-fifths and one-fifth.

Why they should have desired these profits to be divided in the syndicate proportions instead of taking the profits through their dividends, in the proportions in which they held the stock of the Dayton Metal Products Co., the purchaser of the shares, has not been made clear. The Talbotts and Kettering also took an option from the Dayton Metal Products Co., to repurchase all the shares at any time within five years for the sum of \$999,500.

Dayton Metal Products Company.

Colonel Deeds originally held one-fourth of the stock of this company, or 500 shares. It appears from the minutes of the Board of Directors that at a meeting of the Board in Dayton, on May 21, 1917, President Talbott stated that the company had been advised by the Ordnance Department of the Army "that, in all probability, the entire facilities of the company would be utilized for munition work, and, in all probability, contracts would be given to the company as soon as appropriations were made by the Government."

It is further set forth "that Mr. E. A. Deeds explained that he had been called to Washington and requested to take place on some of the committees of the Council of National Defense; that he had been to Washington and that he had accepted the call, and he therefore desired it that he might act as uninterested, directly or indirectly, in any manufacturing plant which was contemplating business with the Government, and that he desired to offer his resignation as vice-president and as director of the company." The minutes show the acceptance of this resignation and that Mr. Kettering was elected vice-president. The minutes of the

meeting of May 21, 1917, conclude with the following statement:

At this meeting Mr. Deeds offered for sale and discussed probable purchasers for his stock in the Dayton Metal Products Co., and Mr. Deeds offered to the directors his entire holdings of stock at its book value less 15% to cover costs and probable losses in view of the possibility of no future Government contracts being secured and the business of the company would have to be readjusted into lines being developed by the Experimental Department.

Some time subsequently—in the early part of the year 1918—the accountant drew a line across the last-mentioned statement in the minutes. He explains that he did not consider it "a corporate record," but a matter between the stockholders.

The testimony of the parties concerned is that Talbott, Sr., Kettering and Talbott, Jr., purchased all Deeds' shares in the Dayton Metal Products Co., at their book value as of May 1, 1917, less 15 per cent. and gave in settlement of the purchase price their notes as follows:

H. E. Talbott.....	200 shares	\$207,706
C. F. Kettering.....	200 shares	207,706
H. E. Talbott, Jr.....	100 shares	103,853

The notes were dated May 22, 1917, were payable to Deeds' order one year after date, with interest at 4½ per cent. and were placed in the hands of George B. Smith, the confidential agent of Deeds and Kettering. The notes were wholly unsecured. According to the stock certificate book the old certificates were cancelled and new certificates issued to the Talbotts and Kettering under date of May 22, 1917.

It is not only open to doubt whether the transaction described in the minute book took place on May 21, 1917, but on all the evidence it is reasonably clear that it did not take place on that date. The minutes are typewritten and pasted in the minute book.

No one of the parties is willing to testify positively that the proceedings described in the minutes took place on that day. Mr. S. S. King, of the Dayton Lumber & Manufacturing Company, has testified that he and Deeds went to Washington on the same train on May 18, 1917, and that they were in communication every day in Washington, from May 19th to 23d.

Furthermore, it appears that on May 21, 1917, when Mr. Deeds is represented as making his statement at the meeting of directors in Dayton, he was making his first appearance, according to the minutes of the Aircraft Production Board, at a meeting held by that Board on that day in Washington. He himself testifies that he was in Washington on that day.

While Mr. Deeds is represented as resigning his office as vice-president of the Dayton Metal Products Co. in May, 1917, he continued to draw his salary until the end of June, 1917. The notes were placed in the custody of the confidential agent Smith, but he made no entry in Deeds' bills receivable book of these notes, until September.

It does not satisfactorily appear, in view of the nature of some of the items, that the adjustment of accounts in fixing the book value and the determination of the amounts of the notes could have been made before June 30, 1917.

There are stock certificates bearing the date of May 22, 1917, and purporting to have been issued after the issue of the new certificates to the Talbotts and Kettering for the Deeds' shares, but these certificates were issued to members of the Talbott family dividing the shares he had formerly held.

Upon all the evidence, it is not established that the stock was purchased as early as May 22, 1917, and there are many indications that the transaction was dated back to that date.

However, Colonel Deeds' stock was actually transferred on the books of the company, and the notes dated May 22, 1917, were given, apparently not later than September, 1917.

On Dec. 31, 1917, interest was paid by the makers on their respective notes to that date; and interest was paid quarterly thereafter. On Jan. 18, 1918, Talbott, Sr., paid \$7,706 on account of the principal, reducing his note to \$200,000; in February, 1918, Talbott, Jr., paid \$3,853 on account of the principal, reducing his note to \$100,000, and on Sept. 11, 1918, Kettering paid, on account of his note, the sum of \$10,000.

If the transaction was a *bona fide* sale of the stock Colonel Deeds thereby parted with all his stock interest in the Dayton Metal Products Co. and thus did not have, by virtue of an interest in that stock, an interest in the profits of the Dayton Wright Airplane Co. The parties all deny that there is any secret agreement or option or understanding of any sort for a retransfer of the shares to Colonel Deeds, or for a sharing of profits with him.

To conclude: The fact is that the transfer of the shares in the Dayton Metal Products Co., which owns the stock of the Dayton Wright Airplane Co., was made to Colonel Deeds' intimate business associates on their unsecured notes, which are overdue and unpaid save to a small extent. But there is

no proof upon which it can be charged that Colonel Deeds retained an interest in the Dayton Metal Products Co. and thereby in the Dayton Wright Airplane Co.

The Wilbur Wright Field

This is a tract of about 2245 acres leased to the Government by the Miami Conservancy District, of which Mr. Deeds was the head. It was a portion of the area selected by the Miami Conservancy District for the impounding of waters in the event of a serious flood. The property was acquired by the Government for a flying field and was developed by the erection of hangars, barracks, a storehouse and other structures. Upward of \$3,000,000 has been expended by the Government in this development.

On April 30, 1917, Major (now General) Foulois was directed to inspect land sites for aviation purposes at various places, including Dayton, and several tracts at Dayton were examined by him, and by Captain (now Colonel) Edgar, on May 8. These officers were met at Dayton by Mr. Deeds and both Deeds and Orville Wright accompanied them on their inspection of the tracts in the vicinity. As to these, on May 11, 1917, Major Foulois reported as follows:

The largest tract of land inspected is about ten miles from Dayton and contains about 4000 acres. This tract of land is admirably suited for aviation purposes, is under the control of the Conservancy directors and any portion of it can be acquired by the Government at a very low cost. The purpose for which this land has been set aside by the State of Ohio makes it extremely desirable for aviation purposes, in that it will be always used for agricultural purposes only and no buildings or other obstacles will ever be erected within the area set aside. Options on this tract of land, or any portion thereof, will be mailed to this office within the next few days.

On May 15, 1917, General Squier recommended that the approval of the Secretary of War be obtained for the rental of several aviation training sites, including the one at Dayton which was thus described:

Approximately 2500 acres in the vicinity of Dayton, Ohio, at the rate of \$17,500 per year with the privilege of renewal for three years, and the option of purchase at \$350,000, the cost of crop destruction being \$75,000. This will provide a four-squadron training field.

Mr. Coffin, as chairman, endorsed the proposal, stating that it was "in the judgment of the Committee a wise and necessary action," and the project was approved on behalf of the Secretary of War by the Acting Chief of Staff. On May 19, 1917, General Squier authorized Captain Edgar to lease this site, and others, and to proceed with the contracting for the necessary buildings.

The first lease was signed on May 22, 1917 (by Captain Edgar for the Government and Mr. Deeds for the Conservancy District) for 2075 acres for the period ending June 30, 1917, at the rental of \$2,000, the Government also agreeing to pay \$73,000 to cover damages to crops.

There was an option for renewal for the year beginning July 1, 1917, at the rental of \$17,660, and for a further renewal for the year beginning July 1, 1918, for a tract containing 2500 acres (including the 2075 acres first mentioned) at a rental of \$20,000, and for further annual periods ending July 1, 1922; and there was also an option to purchase the 2500 acres for \$350,000.

Of the proposed tract of 2500 acres, 505.27 acres were found to be marshy and were withdrawn and 250.47 acres, said to be of equal value, were added. This left a tract of 2245.20 acres, for which a new lease was executed on July 1, 1917, for the period ending June 30, 1918, at the rental of \$18,404.59, with annual options of renewal at a rental of \$20,000 until June 30, 1922, with the option to purchase at the same price.

The rental for the first year is explained by the fact that there were 210.47 acres of which possession could not be taken until March 1, 1918. Soon after that date the Commanding Officer at the field stated that 34.94 acres were in the possession of the Government, but that the remaining acres were available for occupancy but "were very low and swampy and in the present condition of no value to the Government." For the Miami Conservancy District it was stated that it had settled with the tenants at considerable expense in order to get possession and it was unwilling to take back the land from the Government.

There is an adjoining tract of 32 acres (part of the original 2500 acres) which with 8 acres additional were sold to the Government as a site for a warehouse.

It appears from the testimony of Ezra M. Kuhns, the secretary of the Miami Conservancy District, that at the time of our entry into the war the District had been able to secure options on only about 300 acres of the tract in question, but when negotiations with the Government began there was swift action. Mr. Deeds had brought the matter to the attention of Mr. Waldon as early as April 24, 1917, and had sent to

him one of the District's engineers with maps. The following telegrams show the activity of Deeds and Talbott:

Telegram Deeds to Kuhns, April 30, 1917:

Washington, D. C., April 30, 1917.

Ezra M. Kuhns,
Miami Conservancy District,
Dayton, Ohio.

Subject of our trip yesterday moving very rapidly and very satisfactorily. There is no doubt in my mind but what we will be successful. Avoidance of publicity very essential. Inspection will be made end of this week or first of next. You and Morgan* must plan now as though it was decided.

E. A. DEEDS.

*Morgan was the engineer of the Miami Conservancy District.

Telegram Deeds to Kuhns, April 30, 1917:

Washington, D. C., April 30, 1917.

Ezra M. Kuhns,
Miami Conservancy District,
Dayton, Ohio.

Options should be rushed in the vicinity of Fairfield raising the price if necessary.

E. A. DEEDS.

Telegram Deeds to Kuhns, April 30, 1917:

Washington, D. C., April 30, 1917.

Ezra M. Kuhns,
Miami Conservancy District,
Dayton, Ohio.

Ohio State University is ordered to-day to co-operate with the Dayton School and Magruder Lord and Knight instructed to report at Camp Borden Canada Monday to learn course of instruction. Publicity will follow these instructions, and no one outside of Signal Corps officers know of our plan for the larger school and so far as everyone is concerned Dayton School is the Wright field civilian school. Think you should advise Wright Morgan Harold Talbott and Kettering so that they will not disclose anything inadvertently. The civilian school will continue, regardless of what is done with the other plan and Ohio state will give the preliminary instruction in military tactics and all class room work while the Wright Field Company will give the instruction in aviation. Harold Talbott should be the channel through which publicity is given out, and there is no objection using the last statement if called upon.

E. A. D.

Telegram Deeds to Talbott, May 11, 1917:

Washington, D. C., May 11, 1917.

H. E. Talbott,
Dayton, Ohio.

Think your whole plan ideal.

E. A. DEEDS.

Telegram Talbott to Deeds, May 11, 1917:

May 11, 1917.

E. A. Deeds,
Care New Willard,
Washington, D. C.

Contracts remaining secured to cover twenty-five hundred acres will be closed by to-morrow evening. Will start Monday on immediate possession of land so the fields will be ready when buildings are finished. This applies to central one thousand acres in front of building. Builders may retain use of buildings and barns for a few months and in some cases until winter, but main fields must be prepared without delay if they are to be used this fall. Think best to give no reason for immediate possession and feel sure we can arrange it. We can arrange financial matters as suggested. Wire if you approve.

H. E. TALBOTT.

Telegram Deeds to Talbott, May 11, 1917:

Washington, D. C., May 11, 1917.

H. E. Talbott,
City National Bank Building,
Dayton, Ohio.

With few exceptions owners can, if necessary, continue to live in their houses for a year thus avoiding necessity of moving this summer. Their teams will be employed, giving revenue to them. District wants to try out flying on large scale and wants to try experiment at once. This is only a suggestion. You doubtless may have a better one. May be necessary to exercise option at once, and if so I will gladly go on District's note for full amount.

E. A. DEEDS.

Telegram Deeds to Talbott, May 12, 1917:

Washington, D. C., May 12, 1917.

H. E. Talbott,
City National Bank Building,
Dayton, Ohio.

Suggest Kuhns Emmett Grant and Brown be here Monday morning for conference on conservancy bringing description of entire twenty-five hundred. Tax value and tax rate of property under discussion. Will be helpful. Publicity can be delayed at this end without difficulty. Everything moving nicely.

E. A. DEEDS

The partiality for this site does not appear to have been warranted by any advantages it can be said to possess. Indeed, no satisfactory reason appears for the securing of so large a tract, as apparently 1400 or 1500 acres would have answered the purpose.

Fields of about 650 acres were selected at Rantoul and Detroit for two-squadron fields, and the field at Dayton was for four squadrons. Both the leasehold interest and the option to purchase are subject to a flood easement. The evidence is that in case of a flood such as that of the year 1913, the impounded water (that is, after the completion of the dam which it is understood will be completed in two or three years) would cover the lowland to a depth of about forty feet; the lowest hangar would have twenty-four feet of water, that is over the eaves, and the highest hangar would have thirteen feet of water. The barracks and various buildings which stand on higher ground would not be seriously affected. The warehouse itself (a large structure) is in a dry place, and the suggestion that some of the property stored there during the past year has suffered from moisture is not supported. Aside from the consequences of flood in the Miami Valley and the use of the area as a detention basin, it should be added

that a considerable part of the tract consists of swamp land which is unsuitable for the use for which it was leased.

There is no evidence that Deeds himself had any interest in the land acquired. He was head of the Miami Conservancy District, but this was a public enterprise not organized for profit. Apparently, at an earlier period, advances had been made by the Dayton Metal Products Company (a portion of which had originally been charged to Deeds personally and later credited back to him and charged to the maintenance account of the company) which had been used for the purchase of options for the District.

The result of this transaction was to leave the Dayton Metal Products Company a creditor of the enterprise but without interest in the land. Mr. Deeds had been appointed on the Munitions Standards Board in March, 1917, and he accepted appointment on the Aircraft Production Board on May 11, 1917. At this time, however, he was acting only in an advisory capacity and it was before the passage of the Act of Aug. 10, 1917. He testifies that his only interest in this project was as a citizen of Dayton.

The Contract for Wilbur Wright Field

The next step was the placing of the contract for development. The contract was signed by Captain Edgar under the direction of the Chief Signal Officer and its terms were not unreasonable. It was on a cost-plus basis with a sliding scale, which as applied to the amount actually expended gives the contractor a commission of seven per cent with a maximum limit of \$140,000. The contractor, the Dayton Lumber and Mfg. Co., was recommended by Deeds.

This company had done nothing in an extensive way for several years, having been engaged since the year 1908 in selling material, and in operating a planing-mill and a lumber-yard. Its capital stock was \$75,000. Prior to April, 1917, one S. S. King had owned 117 of the 750 shares. King's holdings were then increased to 417 shares, and in acquiring these 300 shares King was backed by H. E. Talbott, who as president of the City National Bank of Dayton arranged for a loan of \$60,000 for the purpose. King wrote Talbott on April 25, 1917: "As to the ownership of the stock, if you see fit to back me up in it this can be determined in any manner that you see fit."

It was not long after the control of the Dayton Lumber and Manufacturing Company was thus acquired that the arrangement was made for giving to this company the contract to develop Wilbur Wright Field. King's narrative of the circumstances in which this contract was obtained is very illuminating, and affords a notable contrast to the difficulties of many who unavailingly sought contracts with the Government.

King was sent for by Talbott and informed that he (King) had been "recommended down at Washington to assume the responsibility of putting up some buildings for Wilbur Wright Field," and suggested that he immediately set about effecting an organization for the purpose. This was on Saturday, May 17, 1917, and on Sunday Talbott telephoned to King, asking him to leave immediately for Washington.

Accordingly King went to Washington on Sunday afternoon, taking the same train with Deeds. It was arranged that King should call the next day at Deeds' office, which he was informed was on the same floor with that of the contracting officer, Captain Edgar. Accordingly on the following day, May 19, Deeds introduced King to Captain Edgar and in two or three days, on May 23, the contract was signed. As Colonel Edgar testifies: "King was brought down here by Colonel Deeds and recommended to us as a proper contractor, the most available in Dayton for the work."

The following is a portion of the correspondence between Deeds and Talbott relating to this contract:

Telegram Deeds to Talbott, May 23, 1917:

Washington, D. C., May 23, 1917.

H. E. Talbott,
City National Bank Building,
Dayton, Ohio.

King probably returns to Dayton this evening. He is undertaking something which he alone is unable to get through with. It will be important that you give him a vision of this job and some very definite suggestions how to hit it in a big way. This is the biggest undertaking that has ever been put across in Dayton.

E. A. Deeds.

Telegram Deeds to Talbott, May 23, 1917:

H. E. Talbott,
Washington, D. C., May 23, 1917.

Suggest you personally direct publicity regarding contract to be given soon, so that it will avoid criticism and at the same time tell the story. This is particularly vital because of Captain Waring to start work Friday and the visitors whom I am bringing, who may read the papers. Your good judgment is needed on this.

E. A. Deeds.

Telegram Deeds to Talbott, May 24, 1917:

H. E. Talbott,
Washington, D. C., May 24, 1917.
City National Bank Building,
Dayton, Ohio.

In arranging for contract do not overlook a local contractor

and lumber man in Osborne. Ezra Kuhns knows his name. He has been friendly to us and I promised him something to do on this job.

E. A. Deeds.

Telegram Talbott to Deeds, May 28, 1917:

May 28, 1917.

E. A. Deeds,
Care New Willard,
Washington, D. C.

Just to remind you chartered accountants of Government selection, expense to be paid by contractor and charged to cost of work. Piece work for labor only on various unit sections in various classification of work, will do much towards speed and economy. Each individual transaction to have the approval of officer in charge before it is effected.

H. E. Talbott.

Telegram Deeds to Talbott, May 31, 1917:

May 31, 1917.

H. E. Talbott, Sr.,
Dayton, Ohio.

Wire what progress has been made on Dayton field. This is for our report to the council. If foundations have been started, for instance, and how many men on the job. This only needs to be a rough estimate.

Deeds, Aircraft Production Board.

Telegram Talbott to Deeds, June 1, 1917:

Deeds,

June 1, 1917.

Aircraft Production Board,
United States War Department,
Washington, D. C.

Steam shovel and large trench digging machine now in place. Three cutting gangs at work. Teams and tractors on ground. Carpenters finishing sheds and office for construction purposes. Foundation excavations in progress. Have plant and equipment for six concrete gangs which will be at work early in the week. Sidewalks progressing. Repairing highways to facilitate trucking operations from Dayton. Purchased five new Packard trucks to augment transportation over the existing available trucks. Next week will see everything booming along. All material, lumber, cement, planks, board, roofing, located and on the way. Wish you would think over method of authority which can be given me to rush transportation of railway cars. This looks like the main point of congestion. All departments of construction now organized with experienced and competent supervisors and foremen. All this in spite of the fact that it has rained every day since Waring has been here.

H. E. Talbott.

Despite the indication of these messages, and of his transactions with King, Mr. Talbott testifies positively that he had no interest in the enterprise, except as a citizen of Dayton, and got nothing out of it beyond 6 per cent interest received by the Dayton Metal Products Co. on money loaned.

King had no capital available for the enterprise, nor had the Dayton Lumber & Mfg. Co. King's testimony is:

Q. Did you have the capital to swing that? A. Not without assistance.

Q. Where did you expect to get the assistance? A. When I talked to Mr. Talbott he told me on the Saturday afternoon, I said, "Well, this will take a good deal of money." He said, "Yes, but," he said, "you need not worry about that. We will work out some way for that." He said, "I do not know how we will work it out, but we will work out some way for that."

The financial assistance that King needed was obtained upon the credit of the Dayton Metal Products Co., supported by the personal guaranties of H. E. Talbott and C. F. Kettering. Notes of the Dayton Lumber & Mfg. Co. to the extent of \$400,000 were discounted by the Dayton Metal Products Co. with the American Exchange National Bank of New York. It was originally contemplated that these notes should be endorsed by Deeds and Talbott, as is shown by the following extract of a letter to Mr. Talbott from W. H. Bennett, vice-president of the American Exchange National Bank, under date of June 25, 1917:

Referring to the conversation which the writer had with you on Thursday, I have conferred with Mr. Kenzel, Assistant Cashier of the Federal Reserve Bank, and upon your statement that the Dayton Lumber & Mfg. Co. is under contract with the United States Government for the preparation of the aviation field at Dayton, and that said company is to receive payments on the tenth of each month on the presentation of receipted vouchers for work completed in the previous month; and that it is the intention of the Dayton Metal Products Co. to make advances to said Dayton Lumber & Mfg. Co. of amounts necessary to carry on the work, he ruled that the paper executed by the Dayton Lumber & Mfg. Co. and endorsed by the Dayton Metal Products Co. to cover said funds so advanced will be eligible for rediscount with the Federal Reserve Bank.

Therefore, we feel that it will probably be of mutual advantage to provide for the advance of \$400,000 requested from us by a three months' note executed by the Dayton Lumber & Mfg. Co., to the order of the Dayton Metal Products Co. and endorsed to Mr. H. E. Talbott and Mr. E. A. Deeds. If you so desire, the endorsement of the individuals can be secured by an assignment from the Dayton Metal Products Co. of certain securities now in safe keeping with us to the individuals referred to.

It was subsequently arranged that the endorsements should be those of Talbott and Kettering, who also gave their separate agreement of guaranty. The avails of discounted paper were passed by the American Exchange Bank to the credit of the Dayton Metal Products Co.

It appears from the accounts between the Dayton Lumber & Mfg. Co. and the Dayton Metal Products Co. that, while the latter company ultimately paid the notes, their proceeds were used in large part from time to time for the benefit of the Dayton Metal Products Co.

The credit to the Dayton Lumber & Mfg. Co., thus extended to it upon its notes, was furnished without security, or, as Mr. Talbott put it, with "no further security except in the man (King). I trusted the man; I knew his contract." After the contract had been obtained, King increased his stockholdings in the Dayton Lumber & Mfg. Co. by the purchase of 104 additional shares, borrowing for the purpose \$20,000 from the Dayton National Bank.

It appears that the total amount paid by the Government under the contract with the Dayton Lumber & Mfg. Co., to Aug. 14, 1918, amounted to \$3,115,161.94. This represents the amount paid for the cost of the work, that is, for lumber, materials, etc. The commission or profits of the contractor, which had been paid to that date, amounted to \$102,436.04.

There has been considerable trouble in connection with the contract, and the accounts are far from being in satisfactory shape. An audit of the books of the company was made by Barrow, Wade, Guthrie & Co., to Nov. 30, 1917.

They reported that they found "the payrolls very incomplete, full of errors, corrections and erasures," and that there was "abundant evidence that great laxity and carelessness has been exhibited by the employees of the company, especially those in the paymaster's department."

These statements are amply confirmed by the evidence in this investigation, and the accounts are in course of being reaudited by Government accountants.

The consideration of the various irregularities in the accounts and of the questions to which they give rise must await the result of this examination. It will be observed that the Government has withheld a large part of the compensation of the contractor until a satisfactory adjustment has been made.

Of the profits received from the Government, it would appear that the moneys have been retained in the business of the company, except to the extent of a dividend of \$37,500, that is, 50 per cent on the capital stock.

Of this dividend, King was entitled, on the 251 shares acquired in his name, to \$26,050, and of this amount it appears that he had received 70 per cent, or \$18,235, to July 1, 1918. He had paid \$11,000 on account of his loan (\$21,000) to the Dayton National Bank.

He had paid nothing on the \$60,000 loan from the City National Bank. No agreement has been proved for a division of profits on this contract, and there is no proof that Colonel Deeds has had an interest in the contract or in the Dayton Lumber & Mfg. Co.

Even if it appeared that the Dayton Metal Products Co. was interested in the contract (which would explain transactions otherwise difficult to understand), this fact would not affect Colonel Deeds unless he were found to be interested in that company. The question would thus come back to the transfer of his stock in the Dayton Metal Products Co., which has already been considered.

McCook Field (formerly known as North Field)

This is a field of approximately 200 acres in and adjacent to Dayton, which was leased by the Government from the Dayton Metal Products Co., and has been used for the purpose of making various tests. Lieut.-Col. Vincent first suggested another field (South Field or Moraine Field), and brought the matter to the attention of Colonel Deeds, by whom that field was principally owned. On Sept. 27, 1917, Colonel Deeds sent the following telegram to Mr. Talbott:

Washington, D. C., Sept. 27, 1917.

Mr. H. E. Talbott,
City National Bank Building,
Dayton, Ohio.

Colonel Clark takes letter regarding Moraine flying field with him to Dayton to-night. George McCann has another letter, for Mr. Kettering. Government will lease land, put up buildings and operate experimental field. Lease will be for three years without privilege of purchase, as that is not necessary. Have complete description of property prepared, also statement of cost of buildings already erected and suggest monthly rent arrangement and have George McCann bring them to Washington to complete lease. Have him prepare deed for this property to Mr. Kettering, who in turn, will lease it to the Government.

DEEDS, Equipment Division.

Talbott and Kettering refused to consent to this use of South or Moraine Field, as it was said to be needed for experimentation in connection with the Dayton Wright Airplane Co., and they suggested North Field, or what afterward became known as McCook Field.

The latter tract had originally been purchased by Deeds and Kettering, each of them bearing one-half of the cost, and they had made some improvements, such as leveling, removing trees, etc., and had erected one or two small buildings. The object of their purchase had been to develop a training field for airplanes to be used by civilians, but this project could not be carried out.

The suggestion was that this parcel, with approximately

82 acres of land adjoining, which was owned by the Dayton Metal Products Company, would be suitable for the Government's use as an experimental station. Deeds did not wish to be a party to the lease, and conveyed to Kettering his undivided one-half interest in the parcel owned by them in common, and Kettering then conveyed that parcel to the Dayton Metal Products Co., which thereupon leased the entire tract to the Government.

The lease was dated Oct. 4, 1917. Colonel Deeds was present at the conference at which the terms were settled, and sent the following telegram to Talbott on Oct. 3:

Washington, D. C., Oct. 3, 1917.

Mr. H. E. Talbott,
City National Bank Building,
Dayton, Ohio.

Have worked out a lease for the North Dayton field twelve thousand eight hundred dollars a year without cash payment. It is the best thing that can be done under the circumstances and suggest its acceptance. Craighead will discuss it with you in detail when you see him.

DEEDS, Equipment Division.

Lieut.-Col. Edgar, under the authority of the Chief Signal Officer and the approval of the Chief of Staff and of the Assistant Secretary of War, signed the lease on behalf of the Government. The rental is at the rate of \$12,800 a year, with an option of renewal from year to year until June 30, 1921. There is no option to purchase; the lessor agrees that at the expiration of the lease the lessee may remove the structures and improvements erected by it upon the premises.

The contract for the development of the field was made with the Dayton Lumber and Manufacturing Company, notwithstanding the fact that the contractor had failed to give satisfaction in connection with the Wilbur Wright Field. This is explained by Colonel Edgar as follows:

We had an organization at the Wilbur Wright Field. We had practically reorganized King's force, and it was determined to take them over to McCook Field, which was brought to us by Colonel Deeds as a rush job which must be done immediately. He personally brought the proposition to me as a proposition that had to be put through immediately. They had no place to test the planes that were coming out. We did not pick out McCook Field; we had nothing to do with its location. A contract was made for the rental of the ground of the McCook Field, and we were importuned to take our organization over there with this contractor and finish this job up and it was done.

Q. Importuned by whom? A. By Colonel Deeds.

The total amount expended by the Government upon McCook Field to Aug. 14, 1918, amounts to \$949,085.35, and the contractor's compensation is 7 per cent of the cost with a maximum limit of \$46,200. The amount paid to that date as contractor's profit was \$26,667.65. The remaining portion of the total compensation has been withheld awaiting the audit of the contractor's accounts.

There is no proof that Colonel Deeds has had an interest in the contract for the development of this field. Nor does it appear that he had an interest in the lease executed by the Dayton Metal Products Company to the Government, or in the rent reserved. While Colonel Deeds originally owned a part of the tract leased to the Government, he conveyed—by what purported to be an absolute sale—his interest to Kettering, and was not interested in the lease by Kettering's grantee, the Dayton Metal Products Company, unless he was interested in the stock of that company, a question already considered.

It is understood that the amounts advanced by Deeds in connection with the development of that portion of the tract in which he had an undivided one-half interest were taken into account in the settlement that was made in November, 1917, when the amount to be paid (by notes) to the Domestic Building Company for the plant acquired by the Dayton Wright Airplane Company was determined; but this fact is not sufficient to establish an interest in the lease so as to bring the matter within the range of the Federal penal statute.

South Field or Moraine Field

This is a tract of about 110 acres lying south of the city of Dayton, and a short distance from the plant of the Dayton Wright Airplane Company. The greater portion of the land belongs to Colonel Deeds. It has been improved by the erection of a number of hangars and other buildings. This land was leased about Nov. 30, 1917, to the Dayton Wright Airplane Co. for a period of three years, at a rental of \$1 per year. It is used by that company as a place of experimentation. The expenditures for hangars and improvements upon South Field which had been made by Colonel Deeds had been taken into account in the settlement made with the Domestic Building Company.

Acceptance Field

This is a field lying close to the plant of the Dayton Wright Airplane Company, upon which the airplanes it manufac-

tures for the Government are taken out for trial. The greater part of this field belongs to the Moraine Development Company, and it appears that Deeds is interested in this field as a stockholder in that company. Deeds and Kettering each hold 2055 shares out of a total of 10,003 shares, the majority of the stock being held by Adam Schantz. This field is leased to the Dayton Wright Airplane Co. The transactions relating to South Field and Acceptance Field were with the Dayton Wright Airplane Company and not with the Government.

(3) Colonel Sidney D. Waldon

During the period in question Colonel Waldon was a stockholder in the Packard Motor Car Company. This interest he retained, but he disclosed it to the Aircraft Production Board at its meeting of Aug. 27, 1917, and to the Secretary of War, and it does not appear that he took part at any time in any proceedings of the board or in any other transactions in relation to the Packard company. No interest on his part in any other concern having dealings with the Government is shown.

(4) Colonel Robert L. Montgomery

At the time Colonel Montgomery entered the service of the Government he was one of the directors of the J. G. Brill Company of Philadelphia, holding one share of common stock.

Colonel Montgomery states that he resigned from the board of directors and sold his share of stock on Sept. 22, 1917, before any contract was made by that company with the Government, and that he did not negotiate the contracts in which that company is interested. Colonel Montgomery further states that at the time he entered the Government's service it was agreed with his partners that no member of the firm should have any interest in any concern connected with aircraft work.

It appears that the wife of one of his partners held for some time 200 shares of the stock of the Curtiss Aeroplane and Motor Corporation, which she had purchased in her own right, and then sold it, and that subsequently she bought some 500 shares of the stock of the Wright-Martin Aircraft Corporation. With these transactions Colonel Montgomery had no connection.

Colonel Montgomery's firm (Montgomery, Clothier & Tyler), in August, 1917, took an interest of \$250,000 in an underwriting syndicate through the National City Co., for the flotation of \$5,000,000 six per cent. notes of the Electric Auto-Lite Corporation. Later, Montgomery, Clothier & Tyler issued a circular offering the notes for sale to the public. These notes of the Electric Auto-Lite Corporation were secured, in part, as the circular states, by a specific pledge of collateral among which were shares, amounting to \$12,500,000 in par value, of the common stock of the Willys-Overland Co.

The Farmers' Loan and Trust Co., of New York was made trustee to receive the pledge. The sale of all the notes was completed by Sept. 12, 1917, \$116,000 being sold through Montgomery, Clothier & Tyler, who received \$8,500 in settlement of their interest in the underwriting. Colonel Montgomery states that this transaction, with others, was undoubtedly mentioned to him by his partners at or about that time, but that he never saw the circular or had the transaction fully explained to him until May of this year.

In August and September, 1917, at the time of this transaction, Colonel Montgomery on behalf of the Government was negotiating contracts with the Willys-Overland Co., for the manufacture of engines for training planes. The Willys-Overland Co., not only made these contracts, but also had a substantial interest in the Curtiss Aeroplane & Motor Corp., which at the time had contracts with the Government for airplane engines.

While the Electric Auto-Lite Corp. was affiliated with the Willys-Overland and Curtiss companies, the transaction in question concerned the flotation merely of notes of the Electric Auto-Lite Corp., and the interest of purchasers of these notes in the stock of companies having dealings with the Government was only through the pledge of the Willys-Overland stock as collateral security.

It appears that while Colonel Montgomery's firm took part in the sale of the notes as members of the underwriting syndicate, none of the notes were actually purchased by his firm, either for firm account or for any individual partner, and in these circumstances it is believed that there would be no sufficient ground for holding the above-quoted statutes to be applicable.

Apart from the above matter there is no evidence that Colonel Montgomery has had an interest in, any corporation,

association or firm with which he has dealt as an officer or agent of the Government.

OTHER OFFICIALS

Lt.-Col. Jesse G. Vincent.

In April, 1917, Mr. Vincent was vice-president of the Packard Motor Car Co., in charge of engineering, with a salary of \$25,000 a year. Under his contract with that company, made in 1912, he was entitled to subscribe for certain shares of its stock. On Aug. 15, 1917, having resigned his office, he made a settlement with the company, receiving his salary to that date and a bonus of \$5,000 for the preceding year's work, and at the same time, through the exercise of his option, he acquired \$15,000 of common stock at par which with the stock dividends previously declared thereon gave him approximately 347 shares.

He had purchased outside about 82 shares, so that he became a stockholder in the Packard Motor Car Co., to the extent of 429 shares of the common stock of the par value of \$42,900. This stock he has continued to hold since August, 1917; he has received dividends of 1½ per cent. quarterly with the exception of one quarter for which a dividend was passed.

From about May 27, 1917, until Aug. 15, 1917, Mr. Vincent, while paid by the Packard Company, was actually at work for the Government in the development of the Liberty Motor. It is said that for this period he was 'loaned' by his company to the Government.

On Sept. 3, 1917, he received a commission in the Army with the rank of Major and later he was raised to the rank of Lieutenant-Colonel. About July 1, 1917, he was put in charge, as a civilian, of the Engine Design Section of the Signal Corps and he remained in this service after he was commissioned and until Oct. 1, 1917.

On the latter date, the Airplane Experimental Department of the Signal Corps was established in charge of Lt.-Col. Clark, with headquarters at McCook Field, Dayton, and Major Vincent was associated with this department as its executive officer with his office at the Lindsey Building, Dayton. On February 6, 1918, he was put in charge of the Airplane Engineering Department at Dayton and in command of McCook Field. He is now in charge of the Airplane Engineering Division of the Bureau of Aircraft Production.

Both before and after Major Vincent received his commission in the Army, he had transactions with the Packard Motor Car Co., in which he acted on behalf of the Government. On June 6, 1917, the Aircraft Production Board adopted a resolution which provides, after recitals, as follows:

Therefore, Be It Resolved, That the Board proceed immediately to secure space wherein to bring together sufficient draftsmen under a competent engineering organization to produce complete designs of 8 and 12 cylinder motors, to be known as the US-8A and US-12A respectively; that the design for the 4 and 6 cylinder motors follow as soon as practicable, these motors to be known as the US-4A and US-6A respectively. These designs and drawings to be made to include the designs and drawings for the special tools necessary to produce the parts of these motors. The Board should undertake to have the parts made wherever in its judgment they can be most quickly and advantageously done and have them sent to Washington and assembled here in space to be secured, parts to be made for Five (5) US-12A and five (5) US-8A.

And Be It Further Resolved, That the Board recommend to the Office of the Chief Signal Officer that the sum of \$250,000 be immediately set aside to carry on this work and that a disbursing officer be assigned to handle this fund.

This allotment, or \$249,159.10, was paid to the Packard Motor Car Co. for drawings, models, tests, etc., and for six US-8A's and five US-12A's which were to serve as standardized engines. No written contract for this work or written order for this work setting forth unit prices or specifying the terms on which the work was to be performed is found in the files of the Signal Corps, and in this respect the proceeding was very irregular. Instead of there being an appropriate agreement or written order, it appears that verbal orders were given from time to time by Mr. Vincent, which, it is testified, were confirmed in conversations with Mr. Deeds.

The first voucher presented by the Packard Company for this development work was for \$104,500, which was paid on Aug. 11, 1917, upon a certificate of Mr. Deeds, then a civilian in charge of the Equipment Division. While Mr. Deeds was familiar in a general way with the work, it does not appear that he or any one else acting for the Government, except Mr. Vincent, had detailed information as to what had been done or as to actual cost.

The exact amount of the outlays could not then be stated either by the company or by Mr. Vincent and, while definite amounts were placed opposite particular services and engines described in the voucher, these amounts were mere estimates.

The voucher did not so state, but the payments were virtually payments on account. Included in this first voucher (paid Aug. 11), were the salaries and traveling expenses, as estimated, of those in the engineering organization which Mr. Vincent had effected for this development work, including the salary of Mr. Vincent himself after he came to Washington as above stated. As he testified:

In other words, this item was intended to cover not only the making of drawings, but the moving of engineers here to date and also a lot of traveling expenses incident thereto . . . that was all lumped under original design work. . . . Q. Was there any itemization of that anywhere? A. There was not, because it was impossible to make any such itemization. I knew roughly what it would cost. . . . Q. How much of that amount of \$37,000 included in that voucher (that is, the voucher for \$104,500) was for salaries? A. I should say about one-third. Q. For what period were those salaries allowed? A. They were allowed for the period that the men were actually on the job.

Q. Is your salary included in the \$37,000? A. I think it is.

Another voucher in similar form for \$73,194.72 was presented by the Packard Co., on Nov. 20, 1917. It was accompanied by a letter from Major Vincent, representing the Engine Design Section of the Signal Corps, to Colonel Deeds which stated:

I have personally supervised this work and hereby certify that all of the above material has been delivered to the Government and is now being used for Government purposes.

The prices at which the engines are billed are only approximately correct and may be high or low, but this cannot be determined until a final checkup is made when the job is completed. There are several engines yet to be delivered and before we pay for the final ones, I will arrange to have a checkup made in order to insure that the total amount paid for the entire job is entirely fair to both the Government and the Packard Motor Car Company. I would ask that payment be made the Packard Motor Car Company promptly in this connection, as they are going to a great deal of trouble to do this experimental work for us.

A third voucher for \$60,000, for three engines, which was also a mere estimate, was paid on Dec. 6, 1917, on Colonel Deeds' certificate.

The fourth, and final, voucher was paid on Jan. 19, 1918, for the two remaining engines, which were put down at \$5,732.19 each so as to bring the total amount expended for the development work within the above-mentioned allotment of \$250,000. The Packard Company at this time submitted an itemized statement of its outlays which Major Vincent examined and approved. This statement purported to show the total cost of the entire work, that is the cost of material, and of labor, the direct expense (including travelling and other expenses of the organization which Mr. Vincent brought to Washington for the purpose of working on the design of the Liberty Motor) and the overhead charges. These items aggregate \$221,474.75, to which a profit of 12½ per cent (\$27,684.35) was added, making a total of \$249,159.10. Major Vincent wrote the following letter to Colonel Deeds in submitting the final voucher with his approval of the itemization of cost.

Dayton, Ohio, Jan. 19, 1918.

From: Major J. G. Vincent, Airplane Experimental Engineering Department, Lindsey Building, Dayton, Ohio.
To: Colonel E. A. Deeds, Southern Railway Building, Washington, D. C.

Subject: Final Payment on the Liberty Engine Development Order.

1. I am enclosing herewith bills from the Packard Company for the last or No. 6 8-cylinder engine, and the last or No. 5 12-cylinder engine. These bills have been held in abeyance until the Packard Company could furnish us with a final accounting covering the cost of the job.

2. You will remember that the Joint Army and Navy Technical Committee set aside an appropriation of \$250,000 to cover the cost of this job. At the time they set aside this amount and asked me to have ten engines built, I was afraid it could not be done within the appropriation, but am glad to be able to advise you that altogether we built eleven engines, as well as two wooden models, and ran several tests under this order and still kept within the appropriation. You will note that the last two engines are built at \$5,732.19 each, as this just balances out the net cost to the Packard Company plus 12½ per cent profit.

3. As a matter of general information I want to point out that the Packard Company co-operated with us to the limit on this job, and many of their executives gave a great deal of their time to this work for which they received no pay whatsoever. It is also a fact that this work was put ahead of a great deal of other work, causing losses which can never be computed. They did this cheerfully because their heart was in the job, and my only object in mentioning it is to, in some degree, give them credit for their attitude, as I know no one at Washington can possibly realize what this brand of co-operation costs.

4. I want to go on record as stating that I do not know of any other place in the world where this job could have been done at anything like this cost.

5. During the last two years that I was with the Packard Company they spent approximately a half million dollars on aircraft development work—the spending of this money not only put me in position to know what should make an aircraft engine, but it also resulted in the development of an organization at the Packard plant which was ready and waiting to grab this Liberty job. I think you will find the brief résumé of costs entirely satisfactory, but I simply want to state that the Packard Company, of course, have a complete record of all the transactions, if they should ever be required. I think, however, that this job is so obviously reasonable that nothing else will be required. I want to urge that you have final payment made to the Packard Company immediately, as they are

carrying on a lot of development work for us and are, therefore, carrying considerable investment at all times.

(Signed) J. G. VINCENT.
Major, S. C., U. S. A.

The irregularity of proceeding in this manner without a contract or proper order in writing is apparent. No price had been fixed for the work or materials; if only outlays were to be reimbursed, it was necessary that outlays should be appropriately proved before payment was made, and this had not been done in the case of the first three payments.

Nor does it appear that at the time the first voucher for \$104,500 was passed, on or about Aug. 11, 1917, Mr. Deeds had any authority in the absence of a written contract or a proper written order to give the certificate. The Chief Signal Officer testifies that he did not have such authority. Nor was his certificate itself accurate in its terms, as there was no agreement for a price, and if there was an agreement for the reimbursement of actual outlays, the voucher, being a mere estimate, was not in accordance therewith.

It should be said, however, that the evidence does not afford ground for the conclusion that the Government was defrauded or that there was any intent to defraud the Government on the part of any of the parties concerned.

The work was development work, these first engines being made by hand in advance of tooling up for quantity production in order to standardize the design, and it does not appear that the services rendered were not worth the amount paid or that the estimates of the outlays were not fair estimates; that is, that the amounts as estimated were not actually expended as set forth in the final statement.

Both Major Vincent and Mr. MacCauley, the president of the Packard Motor Car Co., testify that the amount paid under these vouchers as finally adjusted did not embrace any expenses incurred in the original work of the Packard Company in developing an aircraft engine, that is, prior to the time when Mr. Vincent came to Washington on May 27, 1917. Viewed as an arrangement for services on a cost plus basis, the allowance of profit does not seem to be excessive. While the vouchering was irregular, there is no sufficient basis for a charge under the statutes relating to false and fraudulent vouchers or the facilitating or obtaining of payments with intent to defraud the Government.

A distinct question, however, is presented as to Lt.-Col. Vincent. Section 41 of the Criminal Code explicitly prohibits any person who is directly or indirectly interested in the pecuniary profits or contracts of a corporation from acting as an officer or agent of the United States for the transaction of business with such corporation. It is manifest that Lt.-Col. Vincent acted as an officer and agent of the Government for the transaction of business with the Packard Motor Car Company in which he was a stockholder, and that this was in violation of the statute.

Lt.-Col. George W. Mixer

Lt.-Col. Mixer, formerly vice-president of Deere & Co. of Moline, Illinois, manufacturers of agricultural machinery, came to Washington in July, 1917, to undertake the organization of the Inspection Department of the Aircraft Engineering Division of the Signal Corps. He was later chief of the Inspection Department of the Equipment Division of the Signal Corps. He was commissioned as an officer in the Signal Corps, with the rank of Major, about Aug. 15, 1917.

The work of the Inspection Department covered the inspection or acceptance of material and manufactured articles furnished to the Signal Corps, including the inspection of airplanes and engines manufactured under contracts with the Government.

As chief of the department, Major Mixer dealt with the matters of organization and personnel and exercised a general supervision over the department in matters of administrative policy. In May, 1918, Major Mixer was made Production Manager and on the reorganization which resulted in the establishment of the Bureau of Aircraft Production he continued to carry the title of Production Manager, being directly under Archer A. Landon, who is Director of the Production Division which is broadly charged with the actual execution of the aircraft program after the receipt of engineering data.

Prior to his connection with the Government, Mr. Mixer held 25 shares (par value \$2,500) of the preferred stock of the Curtiss Aeroplane and Motor Corporation. He has not disposed of this stock. He testifies that he had sold his common stock in the company about two years ago and that he had not given thought to the retention of the few preferred shares; that his personal accounts are kept at his office in Moline, and are in charge of his secretary.

The Curtiss company had important contracts with the Government for the production of aeroplanes and Lt.-Col. Mixer was in charge of the organization of the inspection of materials and products at its plant as well as at other plants,

and he visited the Curtiss plant from time to time in the exercise of his authority as head of the inspection department and as production manager, and as an officer of the Government he dealt with such questions at this plant as required attention.

The statutory phrase "transaction of business" is broad enough to embrace the activity of officers or agents of the United States who are heads of divisions having charge of the inspection of products under contracts requiring the action of Government inspectors in course of performance.

It would be a narrow construction to hold that the statute (Crim. Code, Sec. 41) is limited to the making of contracts or the placing of orders or transactions relating to payment or discharge. It would seem to be quite as important that the chief of a department of inspection, selecting the inspectors who act under his instructions at the plants of contractors, should be free from interest in the corporation whose work is inspected, as the inspectors themselves, and both the chief of an inspection department and the inspectors may properly be regarded as agents of the Government for the transaction of business with the corporation.

The same would be true of the production manager having supervision of production under contracts with the Government. No ruling in the Federal Courts with respect to the applicability of the statute to such an officer or agent of the Government has been found. In the view that the statute has the scope suggested, Lt.-Col. Mixer acted as an officer or agent of the United States, contrary to the prohibition, for the transaction of business with the Curtiss Aeroplane and Motor Corporation, in which he was a stockholder. His holdings were small, but it cannot be said that for that reason the statute is inapplicable.

Major Howard C. Marmon

Major Marmon joined the Signal Corps about June, 1917, and almost immediately was sent to Europe with the Aeronautical Commission. On his return he was assigned to duty with the Airplane Experimental Department at McCook Field, Dayton. Prior to his service with the Government he was vice-president and engineer of the Nordyke & Marmon Co. of Indianapolis, which was engaged in manufacturing mill machinery and motor cars, and he held \$15,000 in par value of the stock of that company, its book value being several times its par.

On entering the Army, he gave to his brother a power of attorney to dispose of his shares and they were transferred to his mother, Mrs. Elizabeth C. Marmon, and have since stood in her name. The transfer was a gift; Major Marmon testifies that he has no interest in the stock. His mother turns over to him the income of other property which is the equivalent of the salary he had previously received from the Nordyke & Marmon Co.

The Nordyke & Marmon Co. has a contract for 3000 Liberty engines, and spare parts, and previously had a contract, which was filled, for 1000 Hall-Scott engines and spares. The evidence is that Major Marmon had no part in the negotiations relating to these contracts or with the supervision of inspection, production or payments.

He has been engaged in the airplane experimental department, or engineering department at McCook Field. It does not appear that he has had any transaction with the Nordyke & Marmon Co. save that he sent to that company, with others, from McCook Field, the blueprints for the Liberty engine.

It also appears that he signed a communication from McCook Field relating to a Marmon automobile which had been ordered by Lt.-Col. Vincent for that department. Taking all the facts into consideration, there is no sufficient ground for a charge of violation of the statute in his case.

Second Lieut. Samuel B. Vrooman, Jr.

In a subsequent portion of this report, reference is made to the Mahogany Manufacturers and Importers Association, a voluntary association of the leading mahogany manufacturers of the United States, which was formed last January in connection with negotiations for the purchase by the Government of mahogany for airplane propellers.

One of the members of the association is the S. B. Vrooman Co. of Philadelphia. Second Lt. Vrooman is the son of Samuel B. Vrooman who was head of this company until his death a short time ago. Second Lt. Vrooman is thirty-one years of age and for upwards of nine years was at work in his father's company handling lumber, inspecting and selling. On his marriage in June, 1917, his father gave him \$10,000 in par value of the company's stock, which for some years has paid 20 per cent dividends annually.

This stock he still holds. In addition to the dividends on his stock, the S. B. Vrooman Co. has continued to pay him, since he entered the service of the Government, the sum of \$50 a week, which is the equivalent of the compensation

he previously received for his services to the company.

In December, 1917, S. B. Vrooman, Jr., became identified with the Equipment Division of the Signal Corps as a civilian and was made an inspector of mahogany purchased by the Government. In February, 1918, he was put in charge of the inspection of all propeller lumber. He selected the district officers, who in turn selected the inspectors.

Mr. Vrooman issued instructions to the district officers, visited the plants to see that the inspectors were doing their duty, and passed on disputed points. He has continued in this service and in July, 1918, received a commission as Second Lieutenant.

Among the plants subject to his jurisdiction as head of inspection of propeller lumber is that of the S. B. Vrooman Co., which has had contracts with the Government and is within the territory assigned to the district office at New York. S. B. Vrooman, Jr., selected the head of this office, Mr. McCullough, who was responsible to him for the efficiency of the inspection and for the carrying out of his instructions, which related to the inspection at the Vrooman plant as well as others.

The conclusion is not to be escaped that S. B. Vrooman, Jr., was the agent of the Government directly responsible for the proper inspection of the mahogany delivered by the S. B. Vrooman Co. to the Government under its contracts, and that his acting as such agent for the transaction of business with the corporation in which he was a stockholder was in violation of the statute.

FOURTH. THE AIRCRAFT PROGRAM

At the time of our entry into the war we had no combat planes, and only a few planes for training and scouting purposes. Approximately 100 airplanes had been delivered to the Army up to the year 1917. There were few flyers and still fewer who had any acquaintance with aviation engineering. The airplane manufacturing industry was in its infancy in this country. But these difficulties were not concealed. The necessity of prompt endeavor to surmount them and of securing at once the full benefit of foreign experience was obvious.

On May 22, 1917, the Joint Army and Navy Technical Aircraft Board, consisting of officers of the Army and Navy especially qualified by reason of aeronautical experience, made a series of recommendations to the Secretary of War and the Secretary of the Navy, which were duly approved by each secretary. It was recommended that there should be purchased by the Army (from the Curtiss Aeroplane and Motor Corporation) "700 Curtiss JN-4 advanced training planes, equipped with the Curtiss OX-5 engines, with 50 per cent extra engines and appropriate amount of extra engine and airplane spares." The purchase of 100 Gnome engines (40 for the Navy and 60 for the Army) from the General Vehicle Co. was also advised. It was recommended "that no action be taken on the suggestion by the Aircraft Production Board for the purchase of the Standard J airplanes, pending tests of this machine by Army flyers." Other recommendations were as follows:

9. The Board recommends that the Aircraft Production Board take immediate steps to obtain complete working drawings, complete machines for use as samples, and to arrange for the manufacture in this country of the following airplanes and engines:

AIRCPLANES

- Sopwith, 1 1/2 strutter.
- Spad, 1-place pursuit type.
- S. E. 5, 1-place pursuit type.
- Sopwith, 130-hp. Clerget, 1-place pursuit type.
- D. H. 4, 2-place reconnaissance.
- B. E. 2 D, 2-place reconnaissance.
- White, Gnome pusher, seaplane.
- Two types of Fairey seaplanes; 130-hp. Clerget type and also a Campania type.
- Farman, with a 150-hp. Hispano Suiza engine, seaplane.

ENGINES

- Lorraine-Dietrich 250 hp.
- Clerget, 130 hp.
- Hispano Suiza, 200 hp.
- Rolls-Royce, 270 hp.
- B. H. P. 200 hp.
- Gnome Mono-soupape, 170 hp.

The same Board on May 23 made further recommendations to the Secretary of War and Secretary of the Navy, which were also approved, as follows:

3. It is estimated that the needs of the United States Army for heavier-than-air aircraft until July 1, 1918, will be as indicated hereinafter and it is recommended that a building program to accomplish these needs be started at once.

TRAINING

Under the present conditions in order to meet the needs of the United States Army only.

Type of Airplane	Number Required	Type of Engine	Number Required
J. N.-4	3,540	OX-5	7,000
DeH.-4	1,750	R-R or equivalent	3,500
S E-5	600	H-S	1,200
S.P.A.D.	600	H-S	1,200
Sopwith	600	Clerget 130	1,200
J. N.-4	0	Hall-Scott A-7-a	1,000

(Stop gap order)

In the event that the United States are called upon to train foreign flyers in addition to United States Army flyers.

Type of Airplane	Number Required	Type of Engine	Number Required
J. N.-4	5,000	OX-5	10,000
DeH.-4	2,500	R-R or equivalent	5,000
S E-5	800	H-S	1,600
S.P.A.D.	800	H-S	1,600
Sopwith	800	Clerget 130	1,600

airplanes and engines shown on the attached table, which also includes a schedule of guaranteed deliveries.

You will also find annexed a schedule of approximate prices of these airplanes and engines and a draft of the proposed agreement between the American and French governments which is now in the final stages of execution, although the orders have been actually placed by the French Government with its manufacturers. This agreement has been prepared after conference with the Judge Advocate General and his staff here and considerations of the arrangements under which England is having engines built in France.

Foreign Orders

Accordingly Major Bolling reported that the following orders had been placed abroad:

IN FRANCE:

Training Airplanes:

725 Nieuports with Le Rhone engines and 150 Spads with Hispano engines. Deliveries to be in time to meet U. S. training program in France.

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
Service Airplanes:								
1500 Breguet (Renault & Fiat).....	60	60	460	460	460			
2000 SPAD (200 hp. Hispano).....				135	300	400	550	615
1500 New Spad (150 Gnome).....			50	100	200	300	350	500
or								
1500 Nieuport (150 Gnome).....			300	400	400	400		
Service Engines:								
1500 Renault (300 hp.).....	60	60	460	460	460			
4000 Hispano (200 hp.).....			135	375	565	755	945	1225
3000 Gnome (150 hp.).....			400	400	400	600	600	600

IN ITALY:

500 S. I. A. 6 B (reconnaissance and day bombing airplane similar to the Breguet). Deliveries to begin October and be completed in December.

200 to 300 Caproni biplane with the new Isotta-Fraschini engine. Deliveries prior to June 30, 1918.

A formal contract was made between General Pershing and the French Government under date of Aug. 30, 1917, for the 5000 service planes and 8500 engines above described. The French Government entered into this contract upon the express condition that the United States should furnish the machine tools and raw materials which were fully listed.

In order to perform this condition, a contract was made under date of Oct. 4, 1917, by the United States Government with The J. G. White Engineering Corporation, by which the latter was to act as an agent for the purchase of the required materials on the basis of cost plus three per cent as compensation.

It turned out that there was great difficulty in obtaining these materials as the French specifications in important instances could not be met at the time by American manufacturers. While the contract with the French Government called for deliveries of materials for planes two and one-half months before delivery of the finished planes, and materials for engines three and one-half months before delivery of finished engines, and that all materials advanced by the French Production Service should be replaced not later than Nov. 1, 1917, it appears that only 14 per cent of the required materials had been placed at points of embarkation in the United States by Nov. 1, for shipment to France, 46 per cent by Jan. 1, 1918, and 67 per cent by March 1, 1918; 91 per cent was delivered at points of embarkation by June 1, 1918, and 99 per cent before the end of August.

From information recently received it appears that all materials shipped under the contract arrived safely in France and that substantially all have been satisfactory as to quality. For the materials thus delivered during the fiscal year ending June 30, 1918, there had been paid to The J. G. White Engineering Corporation \$9,005,074.31, of which \$8,742,412.29 represents the purchase price and \$262,662.02 the agreed compensation.

It is understood that in December, 1917, in view of the existing conditions, and the serious need for airplanes on the part of the French, the original contract was modified by a new contract calling for about one-quarter of the deliveries within the period contemplated in the first contract. The exact terms of the second contract are not now available here. It is also understood that further orders were placed with the French Government from time to time.

The deliveries originally contemplated on the foreign orders were not made; most likely by reason of the delays on the part of the United States in furnishing the required materials and the increased pressure of the needs of the Allies.

Deliveries on Foreign Orders

Up to Feb. 1, 1918, it appears that only about 600 planes had been received under the orders placed with the French Government, of which only about 70 were fighters and bombers. The situation as it then existed is disclosed in the cable from General Pershing under date of Feb. 16, 1918:

P. 610 Paragraph 1-A. Dated Feb. 16, 1918.
Conference to-day between Chief of Air Service A. E. F. and French Under-Secretary of State for aeronautics develops fact that

6. It is recommended that the Aircraft Production Board of the Council of National Defense take steps immediately to advise concerning the formulation of the plans how best to obtain in this country the following airplanes and engines with the designs of these airplanes and engines and the rights to manufacture them in this country.

Airplanes

Type	No.	Type	No.
DeH.-4	2	R-R	4
S E-5	2	H-S	4
S.P.A.D.	2	H-S	4
Sopwith	2	Clerget	4
		130	
B E 2 C	2	R A F	4
Farman seaplane	2	H-S	4
Martinsyde	2	R-R-190	4
Sopwith	2	Clerget 110	4
1 1/2 strutter			
Handley-Page twin	4	R-R	16
Caproni	2	C U R 92 Rh-110	4
Savoia	2	With engine	4
Savoia	2	With engine	8

7. In addition, all such modern German airplanes complete with engines as it may be possible to obtain. These may be obtained either from the Allies or from Holland.

8. Additional Engines Desired.

- 4 Lorraine-Dietrich, 250 hp.
- 3 Clerget, 130 hp.
- 2 Hispano Suiza, 200 hp.
- 3 Rolls-Royce, 270 hp.
- 2 B. H. P., 200 hp.
- 4 Gnome Mono soupape, 170 hp.

Report of Aeronautical Commission

Two months after we had entered the War, an Aeronautical Commission was sent to Europe. This Commission, which sailed on June 17, 1917, in charge of Major (afterwards Colonel) R. C. Bolling, was composed of Army and Navy experts and civilians. Captain Virginius E. Clark and Captain Edgar S. Gorrell represented the Army, and Navy Constructor G. C. Westervelt and Lieutenant Warren G. Child represented the Navy.

Major Bolling's report was sent from Paris on Aug. 15, 1917. The governing principle for the American Production program was stated by Major Bolling to be:

First. The United States must first provide itself with all airplanes and engines required for training purposes in America.

Second. The United States must next provide the airplanes and engines necessary for use strictly in connection with the operation of American forces in the field. It is best known in Washington what will be the size and composition of the American forces in the field at any given dates in the future. You have the information as to the number of types of airplanes required in direct connection with military operations of these forces. We have learned nothing to change the views on that matter which were held by Major Foulis when we left Washington.

Third. After these first two considerations comes the American program of putting into the field next year air forces in excess of the tactical requirements of its army in France. It is greatly desired that the United States shall do this. Such air forces should consist of fighting airplanes and bombers. (Then follows a statement of the proportions deemed advisable.)

The conditions of European production were described; and the advisability of obtaining through foreign orders the supply of airplanes and engines required for use at the front and in training abroad for a period extending to July 1, 1918, was strongly emphasized, as is shown by the following extract from the report:

In our opinion these American needs may be divided into two periods: First period, from the present time to July 1, 1918. Second period, subsequent to July 1, 1918. With every confidence in the ultimate performance of the American production program our investigations of production experience over here and of the sea-transportation situation have convinced us that airplanes and engines produced in America cannot be actually delivered at the front in any great quantity prior to July 1, 1918. Subsequent to July 1, 1918, we believe that American production will not only take care of our needs but may become a large factor in maintaining the air forces of our allies. In considering the period between now and July 1, 1918, due weight must be given to the experience of all foreign countries and manufacturers in the delays in airplane and engine production which were not and could not be foreseen. Only at close hand can one appreciate how many and how great those delays have been.

After long and careful consideration of this subject we and all others here have come to the very strong conviction that most of the airplanes and engines for American use at the front and for our training here between now and July 1, 1918, must be produced either in France or Italy, where effective and successful methods of production are already in full operation. Because we consider this imperative, and absolutely essential to prevent failure of our air campaign next year, an arrangement has been made with the French Government under which they are to produce for us the

due to non-arrival in France of sufficient raw materials French production of aeroplanes and engines is insufficient to meet needs of French and American air service during the next three months. Nine American squadrons will be available for front line service next month and if military necessity requires that they be put into front line service several of these squadrons must be equipped with inferior types of aeroplanes purchased from the French Government, a procedure which is strongly disapproved. Urgently important every effort be made to expedite remainder shipment of J. G. White & Co. materials destined for France—almost 14,000 tons, and also urgently request no delay in shipment of service aeroplanes from the United States.

PERSHING.

Plight of Our Cadets Abroad

There may also be noted at this point the serious delays which occurred in securing adequate provision for the training of American cadets abroad. Hundreds of these cadets were held at concentration camps and other places for several months without suitable training. This was the more regrettable because these students embraced a large number who were exceptionally proficient and who had gone abroad early on the assumption that they would have important and superior advantages in training. It is said that their numbers were larger than the capacity of the French and British schools which it was expected would receive them.

In his cable of March 13, General Pershing speaks of the plight of these cadets as follows:

P. 726, Paragraph 1. Dated March 13, 1918.
For Chief Signal Officer. Approximately 700 cadets are now under flying training in Europe. These cadets had to wait an average time of three months before commencing flying training. Approximately 700 cadets in Europe awaiting flying training. These cadets have already waited from three to five months for training, and it is estimated that some of them will have to wait at least four months before their training can be commenced. All of those cadets would have been commissioned prior to this date if training facilities could have been provided. These conditions have produced profound discouragement among cadets. In order to remedy injustice and to relieve cadets in Europe on equitable basis of rank with cadets trained in the United States request approval of plan to immediately issue to all cadets now in Europe temporary or reserve commissions in Aviation Section Signal Corps subject to revocation in all cases where on completion of training cadets so commissioned are found not to have requisite qualifications for officers in the Air Service. If plan approved will recommend cadets by groups according to seniority. Strongly recommend approval.

PERSHING.

The Secretary of War observed this condition during his visit to France in the spring and cabled that these cadets should at once receive their commissions, which were to be held subject to revocation if later they were not found to be qualified. General Pershing stated in his cable of March 30, 1918, that this relieved the principal difficulty so far as training was concerned and the situation as it then existed was "difficult because of lack of machines for front and not because of lack of training facilities."

Lack of Information Here as to Exact Status of Foreign Orders

Despite constant interchange of cables, information was lacking here as to the exact status of the foreign orders. While cable inquiries had been made from time to time, it appears from a letter written by Lt.-Col. Horner for the Chief Signal Officer to Colonel Bolling, as late as March 12, 1918, that the desired information had not been obtained. There had been apparently an utter lack of an adequate system of communication by which proper records could be kept here of the transactions abroad. Tables and charts of the foreign orders and deliveries were finally received here, but it seems that there still was considerable uncertainty as to the extent of the foreign obligations, and at the beginning of this investigation the extraordinary statement was made by Lt.-Col. S. E. Wolff, then head of the Finance Division, that notwithstanding repeated inquiries, extending over many weeks, he had been unable to ascertain within \$100,000,000 what obligations had been incurred abroad.

Agreement with French Government of May 3, 1918

On May 3, 1918, a new agreement was made with the French Government by which the contract of Aug. 30, 1917, was cancelled. Provision was then made by the French Government for the acceptance of orders of the American Government for aeronautical material, and for the acceptance by the American Government of orders of the French Government for raw materials and other supplies.

As these orders would be intended to meet, in the common interest, the military needs of each country presenting them, it was agreed that each Government should fill the orders so far as compatible with its own requirements and resources.

It was further agreed that upon the arrival in France of raw materials included in the contract of Aug. 30, 1917, they should be delivered to the French Government on the assurance that they would be utilized in accordance with the conditions set forth in the new agreement; and also, that until the American Army should be able to meet its own re-

quirements in aeronautical material, the French Government should place at the disposal of the American aviation units, and such instruction units as may be required, the same aviation material as used by the corresponding French units, both as to quality and quantity.

It would seem that by May 23, 1918, there had been delivered by foreign governments for our use abroad about 1400 training planes and about 350 service planes. Since that time there have been additional deliveries and according to a list obtained by General Kenly the approximate number of airplanes received by our forces from European sources to July 31, 1918, were as follows:

School or training planes.....	1617
Service or combat planes.....	1512

PRODUCTION IN THE UNITED STATES

Recommendations of Bolling Commission

While Major Bolling's Commission, in anticipation of delays here, placed large orders abroad, it is evident that the speediest production in this country that was possible, of a variety of airplanes and engines, was contemplated. The Bolling Commission recommended for production here:

AIRPLANES.

Advanced training Bristol Scout with 80 Le Rhone.
Division or Corps d'Armee Bristol Fighter with 200 Hispano.
Long Range reconnaissance and day bombing B. H. 4 with Rolls-Royce or some other equivalent engine to be later adopted. Fiat 300 has proved successful here.
Fighting or Pursuit (fixed engine) Spad with 200 H.P. Hispano.
Fighting or Pursuit (rotary engine) New Spad with 150 Gnome.
(This airplane is now undergoing final tests.)
Night bombing Caproni Triplane with 3 Isotta Fraschini 270 H.P. engines or other equivalent engine to be later adopted. For very long distance bombing with heavy loads the Italians are now arranging to use the Caproni Biplane with 3 Isotta Fraschini engines instead of the heavier Fiats now used. For distances of 400-500 miles (out and back included) the much greater consumption of gasoline and oil by the Triplane gives it little greater bomb carrying capacity than the Biplane with Isotta-Fraschini engines and the Biplane can be produced much more quickly and in greater quantities. It is also much easier to house at the front. For bombing at shorter distances nothing gives such great bomb carrying capacity as the Triplane.

ENGINES.

80 Le Rhone for training purposes.
200 Hispano Suiza for fixed engine one place fighters and division or Corps d'Armee airplanes.
150 Gnome Monosoupape for rotary engine fighters.
Rolls Royce for U. S. production only under some special arrangement of a Rolls Royce factory in U. S. This engine is not considered suitable for great quantity production. It also requires very skillful mechanics to keep it in commission at the front.

While we have investigated many other excellent engines such as Renault, Fiat, Isotta-Fraschini and S. P. A. all of them are too heavy per horsepower to be recommended as engines for great quantity future production in the U. S. Renault, Fiat and Isotta-Fraschini all have new designs now under test which may prove very desirable. The Bugatti engine appears perhaps to offer the most interesting future development for light weight per horsepower and ease of quantity production. The developments with our U. S. engine now under test are probably the most important consideration in this question of engine production in the U. S. Of course, we are without any adequate information over here as to these developments.

Recommendations of Army and Navy Technical Members of Bolling Aeronautical Commission

Captain Clark, U. S. A. S. C.; Captain Marmon, U. S. A. R. S. C.; Naval Constructor Westervelt, U. S. N., and Lieutenant Child, U. S. N., the Army and Navy technical members of the Bolling Commission, on their return to the United States made a report to the Secretary of War and the Secretary of the Navy under date of Sept. 4, 1917, which embraced the following recommendations:

23. So far as land airplanes are concerned, the types at present indicated as necessary, are the following:

- (A) Primary Training—dual control—about 90 H.P.
- (B) One or two types of machines for training toward the fast fighter—Single seater—using for the present, the 80 H.P. Le Rhone rotary engine.
- (C) Army observation—two seater—using probably between 225 and 250 H.P.
- (D) Single-seater fighter—using a rotary engine of about 170 H.P. (If a water-cooled engine can be built which will, at altitudes, give more power per total weight than the rotary, this type of aeroplane should be eliminated.)
- (E) Single-seater pursuit—should mount an engine which will give about 150 H.P. at 20,000 ft. altitude.
- (F) Day bomber—should mount one engine which will give about 325 H.P. at 15,000 feet.
- (G) Night bomber—should mount two or three of the engines mentioned under (F).

In order to minimize the number of types of engines, it might be desirable to use the same engine in the Army Observation and in the single-seater pursuit. Such an engine should give about 150 H.P. at 15,000 feet.

Recommendations of Captain (afterwards Lt.-Colonel) Clark

Captain Clark, who had a larger experience in aeronautics prior to our entry into the war than any other member of the

Commission, was the expert largely relied upon to make suggestions as to the planes which should be manufactured. He visited numerous factories in England, France and Italy and also observed the types of planes in operation at the front. He testifies that his final recommendations on his return to this country in early September, 1917, after learning the situation with respect to engine production here, were for the production of the following types of planes:

Day bomber DeH-9 with the Liberty direct drive, 12 cylinder high compression engine.
Army observation Bristol fighter with the same engine.
Night bomber, a Caproni triplane with 3 Liberty low compression geared engines (Handley-Page an acceptable substitute).
Two-seater fighter, a Bristol fighter with the Liberty 8-cylinder, or with that number of cylinders which should be developed.
Single-seater pursuit,—the Spad, with the Hispano-Suiza.
Single-seater combat with a rotary engine, 150 H.P. Gnome.
Advanced training machine, Bristol Scout, with 85 H.P. Le Rhone.

PROGRAM AS ADOPTED

Elementary Training planes

There were selected for production to be used as elementary training planes the Curtiss type known as the JN4-D, with the OX-5 engine, and the Standard type known as SJ-1, with the Hall-Scott or A-7a engine. The program called for 4800 JN4-Ds (later reduced to 3700, and this number was somewhat increased after May, 1918); for 1600 SJ-1s; for 7950 OX-5 engines and 2750 Hall-Scott or A-7a engines (reduced to 2250).

Advanced Training planes

For advanced training, it appears that there were originally chosen the Bristol Scout with the Le Rhone 80-hp. engine, the Thomas Morse S-4 with Gnome 100 hp., and the U. S. Training with the Hispano (150 hp.). There were modifications which resulted in the adoption of the types known as S4-B (with Gnome 100 hp.), the S4-C (with Le Rhone 80 hp.), the JN4-H and JN6-H (with the Hispano 150 hp.), and the Penguin (with the Lawrence 28 hp.).

Service or Combat and Bombing Planes

The types first selected for production were the Spad (single-seater pursuit), with the 200 hp. Hispano Suiza engine; the Spad, using the U. S.-8 engine; the Spad Monocoque, using 150 hp. Gnome engine; the Martinsyde; the DeH-9, the Caproni and the Handley-Page, with the Liberty engine (U. S.-12). Subsequently the Martinsyde and the Spads were rejected, the production of the DeH-9 was first limited and then postponed, the Caproni and the Handley-Page were not treated as a part of the immediate program, and the plans for production were centered on the DeH-4 and the Bristol Fighter with the 12-cylinder Liberty engine (U. S.-12).

The program charts which were prepared show extraordinary variations with respect to quantities and surprising expectations as to deliveries. Thus the program for DeH-4s shows a total program on Aug. 2, 1917, of 8000; Aug. 16, of 7500; Aug. 22, of 5000; Aug. 24, of 6000; Aug. 25, of 15,000; Aug. 31, of 6000; Sept. 4, of 15,000; Oct. 17, of 250; Oct. 29, of 1000, at which number it appears to have been continued until Jan. 18, 1918, from which time it was increased until 4500 appear in the program of Feb. 11, 1918, and 8000 in that of Feb. 19 and thereafter.

According to this program or schedule it seems to have been anticipated on Aug. 2, 1917, that 25 DeH-4s would be delivered in October, 100 in November, 425 in December, 750 in January and 1000 in February, and more in each of the succeeding months. Even as late as Sept. 4, 1917, the schedule shows expected deliveries of 62 in October, 1917; 250 in November, 1063 in December; and in the program of Nov. 5 50 were scheduled for delivery in December, 100 for January, etc.

The program of Sept. 5, 1917, for the DeH-9s calls for 2000 of this type; that of Oct. 9, for 4000; Oct. 17, 6750; Oct. 25, 7750; Oct. 29, 7000, at which it continued until Jan. 18, 1918, when it became 7500, to be reduced on Feb. 1 to 5400; and on Feb. 12 the DeH-9 schedule was cancelled.

On Sept. 5, 1917, according to this schedule, deliveries of DeH-9s were expected as follows: November, 1917, 50; December, 200; January, 250, and 300 in February, March, April, May and June. On Nov. 5, 1917, 50 seem to have been expected in January and 300 in February, 1050 in March, 1500 in April, 1900 in May and 2200 in June. As late as Jan. 18, 1918, 40 are scheduled for March and 500 for April.

The program for the Bristol Fighters started on Aug. 2, 1917, with 1000. It appears to have been raised to 3000 on Aug. 16, 1917, within one week it was dropped again to 1000, and on Nov. 26 the program was finally raised to 2000. It seems that on Aug. 2, 1917, deliveries of 25 were scheduled

for October, 50 for November, 100 for December, 125 for January, etc. On Nov. 5, 1917, the schedule calls for 50 in January, 150 in February, 200 in March, etc.

On Aug. 9, 1917, the Caproni program called for 500; on Aug. 16, for 9000; on Aug. 22, for 2000; on Aug. 24, for 500, and there were other variations until the program appears to have settled down after Sept. 28, 1917, to 1000. On Feb. 19, 1918, the program dropped to 50; it called for 250 on May 3, 1918, and was afterwards increased to 1000.

On August 9, 1917, when the program for Capronis called for 500, monthly deliveries of 100 were scheduled to begin in February, 1918. A week later, on August 16, 1917, when the program was increased to 9000, deliveries of 900 were scheduled for December, 1350 for January and each month thereafter. When the schedule was dropped to 1000, deliveries appear to have been expected of 100 in February; and in February deliveries of 100 seem to have been looked for in May.

The Handley-Page program shows on September 5, 1917, a total of 1500, with anticipated deliveries of 100 in December, 300 in January, 400 in February, etc. As late as January 8, 1918, deliveries were scheduled for February of 110, 190 for March, 200 for April, etc. On March 18, 1918, the program had dropped to a total of 50.

These programs, with their variations and schedules of deliveries, appear to be grotesque in the light of the actual facts, but they bear the *imprimatur* of the Planning Department of the Equipment Division with the countersign (except in the case of the DeH-9s) of official approval.

Suspension of the Program for Single-Seater Pursuit Planes

On October 5, 1917, in reporting the failure of the Spad Monocoque, the cablegram from our representatives overseas also contained the following advice as to single-seater pursuit planes with rotary engines:

Recommend you build no rotary engine single-seater pursuit airplanes to be sent to Europe existing machines this type will be out-classed by changing time yours arrive build only what you need for use in United States training purposes.

This, however, did not touch the Spad intended to be used with the fixed engine, that is, with the Hispano Suiza engine. That machine was not experimental. As early as July 15, 1917, there was official advice that "200 H.P. Hispano Suiza (is) now fighting on front in Spad aeroplanes." Colonel Bolling reported in his cablegram of August 1, 1917, that the Spad with that engine is "the best fixed engine fighter now in service." There is no reason why this fighting plane should not have been produced here in quantity many months ago. The failure to do so was not due to lack of facilities, but simply to a change of opinion at a critical time as to what was advisable.

Responding to repeated and urgent recommendations for production of Spads in this country, an order for 3000 Spads was placed with the Curtiss Aeroplane and Motor Corporation under date of September 19, 1917. But this order had barely been placed when doubt was cast upon the enterprise, and after preparation for production was well under way the order was cancelled on November 7, 1917.

This is the date of the cancellation, as testified by Mr. Morgan, then vice-president of the Curtiss Company. It was nearly six months later that the production of a single-seater pursuit plane (the S. E. 5) was undertaken, and thus there was a serious loss of time through a reversal of judgment which was in turn reversed.

It should be noted that virtually all the cables of advice sent by our military representatives abroad are signed "Pershing," but doubtless they most frequently come from subordinate officers, and with respect to the subject under consideration, from those in charge of the Air Service overseas. In a cablegram received here on October 5, 1917, the following appears:

If USA 8 cylinder heavier than Hispano Suiza pounds per horsepower build no monoplace pursuit airplanes with USA 8 cylinder engines. Machine will be useless by time it arrives here. Increase number DH 4s or DH 9s by number monoplace pursuit airplanes. This is necessary provided USA 12 is success. Useful loads increasing so rapidly here that engines now in United States are not considered powerful enough meet requirements. Two-place pursuit airplanes considered most urgently needed airplanes next year.

The view thus set forth found support in influential quarters here. On October 27, 1917, Lieut.-Col. Clark in a memorandum sent to Mr. Coffin expressed the opinion that "all fighting and bombing by day will be done in two-seaters flying in regular formation." And he added, "The single seater will be eliminated." A few days later the following cablegram was received:

Nov. 8, 1917. No. 252 (S. D. 2709) Par. 1.

Your 359, paragraph 7, and other cables concerning American engine program. Situation here has changed much during three

months since original recommendations and continues changing constantly. Following general principles appear clear to us. First. Single seater fighter will probably become obsolete general use next year, although small numbers will always be used special purposes. Recommend you produce number already actually under contract and started. Believe we can obtain here all this type required future above number actually under contract here and America. This applies both single seater fighter airplanes and engines. Second. Two seater fighter airplane with stationary engine will supersede single seater. 400 horsepower probably sufficient next six months, after that five hundred horsepower necessary. This summarizes cables already sent you.

It will be observed that while this message recommended against further production, it distinctly stated that the number, already under contract and started, should be produced. But this was not done.

On November 30, 1917, Colonel Deeds cabled:

Curtiss company have completed drawings and ordered material for Spad for 220 H.P. geared Hispanos. We have cancelled that order. Tulasne suggests possibility of helping the French program by building Spad planes here to be equipped with 220 H.P. geared Hispano engines built in France. We could get production in February without materially affecting output of two-place fighters. We are not urging this because of the fact that we have ordered material which can be utilized in other machines, but if it would help your program here is a quick source for these machines.

To this there was a reply (from London) on December 14, 1917, as follows:

... With reference to paragraph 1 your cablegram 461 do not recommend unionized production Spad airplanes for France. No such request received from French here. Believe they can produce all these airplanes they need. Think our only efforts should be applied airplanes and engines already on our program. United States should leave production single place fighter to Europe.

The Spad contract having been cancelled and preparations for the production of single seaters in this country abandoned, in less than two months there was an urgent request from our military representatives abroad that Spads be produced here. As early as February 10, 1918, it was recommended that steps be taken to "put into production 1000 Spads one-place with 220 H.P. Hispano Suiza engines for earliest possible delivery in France."

It was said that "French delivery of one-place Spads very uncertain and can not be depended upon. Should have more definite information next two weeks as to whether your production Spad one-place fighter should be further increased." While this new proposal was evidently the result of the breakdown in the French deliveries, it seems that a closer inquiry into the progress of our deliveries of raw material abroad and the conditions of French manufacture would have revealed the serious importance of continuing the production of single seaters in this country in accordance with the original program.

However, the authorities here were not then ready to follow the new recommendation, and two weeks later, on February 25, 1918, they cabled the following reply:

Production of Spads with 220 H.P. Hispano Suiza engines does not fit well into our program because engines cannot be put in production without material delay. Probably first deliveries in France in December. We could somewhat more easily produce the 300 H.P. Hispano Suiza engine. We are now producing large number of 150 H.P. engines for training planes, and could even increase production. We believe with this information you will probably decide not to request production of Spads here. Please give us your full advice.

It was not until March 9, 1918, that this cablegram was answered, with the statement that "question being considered. Will advise you soon." On April 6, 1918, Mr. Potter cabled that the British Air Board had advised that they could supply at once two hundred SE-5 planes without engines. He added, "We can arrange production for 180 H.P. Hispano Suiza engines for same at rate of five per day within 30 to 60 days. Shall we arrange engine supply. If so, will you arrange contract for planes." On the same day Colonel Deeds cabled:

We could within four weeks begin to supply 180 H.P. high compression direct drive Hispano Suiza engines to be shipped to England, to be installed in the planes by the plane manufacturer. Would this type of fighting machine be of value to you, and if so shall we proceed to provide them for you? We are advised that this type is in successful use by the British on the front.

On April 19, 1918, the following urgent message was received from our representatives abroad:

The United States should make immediate preparations for the production of single seater machines to supplement those we may receive from France and England.

But on April 21, 1918, there was a further cablegram (referring to Mr. Potter's cable of April 6, 1918) stating that the whole subject was still under consideration. This message was (in part) as follows:

Will the production of 180 H.P. Hispano Suiza engines be interfered with by contracts placed by French or English. If not, we strongly recommend production of this motor for our needs this year on following basis. (Giving delivery dates.) The situation with reference to single seater fighters for remainder of

1918 is as follows: Both France and England have a plane production in excess of their engine production and as the 180 H.P. Hispano Suiza is already in production in the United States in small quantity, our only practical means of securing the necessary number of single seater fighters will be for the production of this engine for overseas duty to be increased so as to provide the number indicated and for us to distribute these engines here month by month as conditions require. The entire question of the provision of single seater aeroplanes for 1918 and 1919 is being thoroughly investigated and a comprehensive report with all data necessary will be forwarded by an officer familiar with the entire situation.

On April 24, 1918, Mr. Potter cabled that contract could be made with the British Government for SE-5s at the rate of 30 per week beginning July 1st; that 180 H.P. high compression Hispano-Suiza motors could be supplied from here for those planes at the same rate, and that the same machine could be put into production here and shipments begun in September. He asked quick advice if arrangements were desired which would permit of "quickest possible delivery of single seater fighting planes on the front," and he added "SE-5 equipped with 180 Hispano is the only machine we can produce quickly."

To this an answer was received on May 4, 1918, disapproving the production of SE-5s, as follows:

Production of SE-5 for 180 Hispano in America disapproved since it appears that necessary planes for this engine can be obtained in Europe either SE-5, Spad or both.

This was followed on May 12, 1918, however, by a cablegram stating that the question was still open pending final report of Board of Air Service officers, and that final recommendation would be cabled in about ten days.

On May 15, 1918, Mr. Potter cabled referring to the message from overseas of April 19, 1918, urging immediate preparation for production of single-seater fighters and calling attention to the fact that the cablegram of May 4, 1918, was an exact reversal of the former recommendation. He said:

We took immediate action on this recommendation and have given orders for 1,000 SE-5s. Your 1052, par. 2-A exactly reverses these recommendations. In view of this inconsistent information and also due to requests for production of SE-5 from Air Division for training purposes, we have decided not to change our orders for production on these machines, and request that samples be sent promptly in accordance with our London 81, par. 3.

The final result is that there has been no renewed order for the production of spads, and that the order for SE-5s is being proceeded with, but that the American machine of this type is still in an experimental stage. It is understood that the machines are being tested, and that the questions which have arisen and have been brought to the attention of the authorities are receiving their consideration. We have not as yet sent from this country to the battle front a single pursuit or combat plane, as distinguished from the heavy observation or bombing planes, and after giving due weight to all explanations the fact remains that such pursuit planes could have been produced in large quantities many months ago had there been prompt decision and consistent purpose.

Delayed Program for the Handley-Page and Caproni Bombing Planes

Although the Handley-Page and Caproni planes remained in the program, production was delayed. Both these types of bombing planes were included in the modified recommendations of the Joint Army and Navy Technical Board on Nov. 21, 1917, and these recommendations were approved by the Secretary of War and the Secretary of the Navy.

Handley-Page Planes

On Jan. 25, 1918, a resolution recommending a contract for Handley-Page planes with the Standard Aero Corporation was tabled by the Aircraft Board, in view of the fact that such an order might interfere with work already undertaken by the company. On Feb. 8 the board discussed the advisability of concentrating upon the manufacture of a single type of night bomber, and it was stated that, due to the lack of history as to the comparative performance of the Handley-Page and Caproni, the decision had been made to put both types into production in the United States.

Arrangements had been made for the assembly in England of Handley-Page machines for the American service, and on Feb. 19 the minutes of the Aircraft Board show that a cable had been received on Feb. 14 by the British War Mission indicating that it would be serious to cancel these arrangements.

The minutes add that in view of "a cable received Feb. 18 from General Foulois recommending the building of both the Handley-Page and Caproni types, because of the military needs for the immediate future, it was decided that at present both types should be constructed," and the secretary was asked to keep before the board's attention the necessity

of making a decision prior to July 1 concerning the concentration on the manufacture of one of these types for the year 1919.

On March 19 the Aircraft Board recommended that a contract be placed with the Standard Aircraft Corporation for the assembling of 500 Handley-Page planes and the furnishing of such parts (other than wood parts) as the Government might require, these planes to be assembled and taken down and disassembled and packed for export shipment to such extent as the Engineering Department should require, but not more than 10 per cent of these, that is, 50 planes, to be fully assembled for testing and flying in this country. Orders for 1000 sets of wood parts and for various metal parts of the Handley-Page were placed. In a letter to Colonel Bloomfield, Air Division, under date of March 20, 1918, M. W. Kellogg, Director of Production, thus summarizes what had been done up to that time:

2. Some time ago miscellaneous orders were placed from time to time, either by letter or word of mouth with people that our Production Department felt could facilitate this matter by having manufacturers start on the work. These manufacturers, as per list attached, have done more or less work. The ones that are further advanced are the W. R. Mullins Company of Salem, Ohio, who are supplying approximately 75 per cent. of the metal parts to be used, also the Grand Rapids Airplane Company of Grand Rapids, Michigan, of the wood parts, they having at this time received about 250,000 feet of spruce and I understand that a large part of this has been in the kilns and they will start work in a short time which, we would judge to be approximately from a week to ten days manufacturing some of the parts. The other manufacturers are in a more indefinite condition. We are now trying to adjust the questions between them and the Signal Corps by giving them a formal contract, and at the same time ascertaining as far as possible the exact conditions of their detail part of the work. Some of these sub-contractors have very small items. As an example, the two tire companies have only been instructed to develop and make the molds for the tires and have manufactured a very few tires each. Other companies have only made dies for a very small percentage of the stampings, etc., etc.

3. We gave a contract a week ago for the assembling of the machines that are going to be assembled, to-wit: fifty, and for the marking, listing, packing, etc., for export abroad for four hundred and fifty, to the Standard Aircraft Corporation who, in connection with our engineers, will use their best efforts to push the work.

4. We are just starting at this time to line up our Production Department on an aggressive assembling of this material and a correlation of same with a view that if it develops that any of the manufacturers are in such a position that they would seriously delay the work, to put pressure upon them to try to overcome such a condition.

5. We are advising you of all these facts to as clearly as possible give you a picture of the situation so that you can use your own judgment and do as he sees fit in this connection.

6. You will note that while he has ordered numerous parts for 1,000 planes, our assembling contract only covers 500. This was done with the distinct understanding that if the contractors did their work efficiently and well and in proper time, we would favor them with a further order of not less than 500 more machines.

The first Handley-Page plane assembled in this country was flown in the early part of July.

The Standard Aircraft Corporation, it appears, was able to produce the first Handley-Page machine within ninety days from the time they were given full authority for that purpose, and the testimony is that, making allowance for whatever advantage existed by reason of the fact that previous contracts had been let for certain parts the first machine could have been produced at the outset within one hundred and twenty days. Further time, of course, would have been required for quantity production, but for the long postponement of the program of the Handley-Page no satisfactory reason is shown.

Caproni Planes

In the minutes of the Aircraft Board, under date of Feb. 12, 1918, it was recited that the Italian manufacturer Caproni had sent to this country samples of his triplane and biplane, with his production engineer, Captain D'Annunzio, expert fliers, and thirteen factory experts, to assist the United States in placing Capronis into production.

On Feb. 7 the board had recommended that a contract be made with the Standard Aircraft Corporation for the manufacture of fifty Caproni planes. Mr. Coffin urged on Feb. 20 that plans be laid for quantity production of Capronis to be assembled in Italy, but it was the feeling of the board that the matter should be held in abeyance until the production of sets of Caproni parts for the Italian Government were under way.

On April 11, 1918, it appears to have been the sense of the Aircraft Board that the Caproni should be put into immediate production, in view of (1) repeated cable advices to that effect, (2) the actual experience in Europe with the Caproni, (3) the fact that Captain D'Annunzio had assured the Signal Corps that there would be no difficulty in the installation of the Liberty motor. On March 21, 1918, Mr. Potter advised the board that the Italian Government did not desire a contract for the manufacture of Caproni parts in this country because of the remoteness of contemplated

deliveries, and inquired the disposition of the board as to the manufacture of 50 complete Capronis, as recommended on Feb. 7. On March 26, 1918, the question of manufacturing the Caproni was again raised in the board, and after discussion was referred to the Chief Signal Officer for the consideration of Colonel Waldon, with especial reference to the question of the establishment of an assembly plant in France.

On April 2 a letter addressed by the Italian ambassador to the Chief Signal officer was referred to the board, inquiring whether the American Government intended to build Caproni planes for its own use, and if so, how many. Discussion was had of the question, "in view of cables recently received urging such production and the expense already incurred by the Government in preparation therefor."

On April 23 Mr. Potter stated to the board that a verbal order has been given to the Fisher Body Corporation for 250 Caproni planes, and that preparations for production were under way. On May 9 it was further stated by Mr. Potter that arrangements had been made with the Fisher Body Corp. and Captain D'Annunzio for the manufacture of 500 sets of Caproni parts by that company, contract for which would be let as soon as funds were available, and that preparation for production was under way, which, however, was not promised before September. Contracts were made in June, 1918, by the Fisher Body Corp. and the Curtiss Aeroplane and Motor Corp., each for 500 Capronis. There were arrangements several months ago, apparently of a tentative character, with the Standard Aircraft Corp. for four Capronis, of which one has been built.

There appears to be no adequate reason for this long delay in putting the Caproni planes into production. If it was due to congestion in plants selected for production this could have been obviated by a better and wider distribution of work. This is, of course, so far as the matter of plane production is concerned. The immaturity of the Liberty motor doubtless had its effect, but it would seem that orders for the motors sufficient to meet all appropriate demands should have been distributed in such a way that there could have been no occasion for delay in the building of planes because of the lack of orders for the engines to go with them.

Postponement of the DeHaviland 9

In his recommendation, on his return from Europe in September, 1917, the DeHaviland 9 was preferred by Captain Clark, as the DeH-4 appeared to him to be obsolescent at the time the Bolling Commission was in England and the DeH-9 was designed along the same general lines as the DeH-4, but with its weaknesses, from a military standpoint, corrected.

In other words, he regarded the DeH-9 as far better suited for bombing than the DeH-4. The principal distinction is that on the DeH-9 the rear man—the gun fighter—is moved back about twenty inches from his position on the DeH-4; the pilot is moved back so that he is placed immediately in front of the gun fighter; the fuel is moved forward so that it is near the engine, and between the fuel tank and the pilot is a bomb compartment.

The contracts with the Dayton Wright Airplane Co., the Fisher Body Co. and the Standard Aircraft Corp., originally called for DeH-9s. When, on Sept. 22, 1917, the program, as it then stood, was submitted to Colonel Bolling on behalf of the Chief Signal Officer, it called for 2000 DeH-9s, and the reply was that the number was not sufficient and should be doubled.

It may also be noted that in the same cablegram (Sept. 22nd) from the office of the Chief Signal Officer it was stated that the first deliveries of the DeH-9 with the Liberty 12, and synchronized Marlin piston type airplane gun, would be made in November, 1917.

The sample machine, however, which was first received from England was the DeH-4. The DeH-9 had not yet been put into service at the front. Apparently there was no sample DeH-9 available here until at the end of February, 1918, and it seems to have been thought that progress had been made to such a degree in the developing of the design of the DeH-4 for production that it was advisable to concentrate upon the production of the DeH-4 to the virtual exclusion of the DeH-9.

Consequently, in the substitution of contracts, the DeH-4 took the place of the DeH-9 and it appears that in February, 1918, directions were received from Colonel Deeds and Colonel Montgomery that orders for DeH-9s were to be cancelled for the present, pending information from abroad.

It seems that with an adequate production program this improved type, or its American equivalent, could have been produced here some time ago, but it has not yet been put into quantity production. It is said, however, that the DeH-9 is

now "being put out of production abroad" because of the "coming in" of the DeH-9A which is a further improvement.

Result

For obvious reasons, it is not deemed advisable to make public the details of the present aircraft program. That can be stated by the military authorities whenever they think it wise to do so. For the present purpose it may be said that the abandonment of the program for the Spads left us, until recently, without any program for single-seater pursuit planes, and that also, until recently, so far as service planes were concerned, there remained a program for immediate production which was virtually limited to DeHaviland 4s and Bristol Fighters.

The Bristol Fighter as redesigned to take the Liberty motor proved to be a failure and after a series of fatal accidents was discarded. The Bristol was so far removed from a machine that could carry an engine of that power that it has been admitted by high authority that it as "a very foolish thing to put the two together."

Thus, nothing is left of last fall's program for service planes save the DeHaviland 4s. The course of production of these planes is hereafter stated. It appears that after the remedying of various defects they are being successfully used as observation and bombing planes. There are certain limitations, which it is not necessary to describe, of their military effectiveness for this purpose, and machines of the later and improved types are to be provided. By reason of a lack of maneuverability the DeHaviland 4 cannot serve the purpose of a pursuit plane.

Engines for service airplanes

The Bolling commission's recommendations for the production of engines in the United States for service airplanes embraced the 200-hp. Hispano-Suiza for fixed engine single-seater fighters, the 150 Gnome for rotary-engine fighters, and the Rolls-Royce for United States production only under some special arrangement for a Rolls-Royce factory in the United States.

It was said that the Rolls-Royce engine was "not considered suitable for great quantity production. It also requires very skillful mechanics to keep it in commission at the front." It was added that the Renault, Fiat, Isotta-Fraschini and S. P. A. were too heavy per horse power to be recommended for great quantity production in the United States and that the first three mentioned had new designs under test which might prove very desirable. Special attention was directed to the development of the Bugatti engine. And this statement of the Bolling commission concluded with the observation that the developments in connection with the United States (Liberty) engine now under test "are probably the most important consideration in this question of engine production in the United States."

Rolls-Royce and Sunbeam Engines—British Experience

There has been considerable testimony as to the feasibility of securing, in the year 1917, the early production of certain foreign engines, notably the Sunbeam and the Rolls-Royce. In order that there might be an authoritative statement of British experience, there was obtained, through the courtesy of the British ambassador, a memorandum under date of June 22, 1918, which has the authority of the British Air Ministry.

From this it appears that when we entered the war in April, 1917, the British had in use the following airplane engines: 160-hp. Beardmore; 150-hp. RAF4-A; 130-hp. Le-Rhone; 130-hp. Clerget; 190-hp. Rolls-Royce; 150-hp. Hispano-Suiza; 275-hp. Rolls-Royce; 320-hp. Cossack Sunbeam; 230-hp. RAF3-A. The following engines at that time (April, 1917) were "coming on": 150-hp. BR-1; 180-hp. Viper Hispano; 220-hp. Geared Hispano; 200-hp. Arab Sunbeam; 220-hp. B. R. 2; 270-hp. Falcon, Rolls-Royce; 140-hp. Clerget; 375-hp. Eagle Rolls-Royce; 260-hp. Maori Sunbeam. With respect to these engines, the memorandum furnished by the British ambassador contains the following statement:

Of those "in use" in April, 1917, all were good reliable engines, but it was obvious that they could not remain in the front rank for very much longer.

Of those "coming on" the two Rolls-Royce engines and the 180 Viper Hispano were practically certain to be a success.

The others were undeveloped and could not have been recommended at that time; so that in April, 1917, no Sunbeam engine could have been recommended for manufacture in America, and the general opinion in England was that the Rolls-Royce was quite unsuited to American methods of production.

A further communication from the British ambassador states that what is quoted above on the Rolls-Royce and Sunbeam may be taken to apply equally to July and August, 1917. It should be added that in 1917 Colonel Bolling cabled advis-

ing against the production of the Sunbeam engine in the United States.

The Hispano-Suiza Engine

A different situation existed with respect to the Hispano-Suiza engine, which had been used extensively abroad. In the summer of 1917 the 150 hp. Hispano-Suiza engine was in production at the plant of the Wright-Martin Aircraft Corp. at New Brunswick, N. J. That company had received an order from the French government in February, 1916, for 450 of these motors. Although the contract was to be fully performed by the late summer of 1916, there was serious delay and deliveries did not begin until March, 1917.

This delay was due in large part to the difficulty of putting into production an article of very fine workmanship and material which was entirely new to American shop practice. The greatest problem in this sort of work has been the procurement of materials of proper refinement and texture.

The delay was also apparently due in considerable measure to conditions which could have been remedied, and a comparatively small force was engaged on the Hispano-Suiza motor work during the year 1916, the main effort of the company at that time being motor car production. (Since the fall of 1917 virtually all the facilities at the New Brunswick plant of the Wright-Martin Corp. have been engaged in the manufacture of airplane engines.)

By Sept. 1, 1917, 202 engines had been delivered under the French contract and by October, 1917, the difficulties had been surmounted; in that month 117 were produced and the French contract was completed in November, 1917.

The Signal Corps placed a number of contracts with this company, reflecting changing purposes. Under date of July 31, 1917, it placed a contract for 500 of the 150-hp. Hispano (Type A). In September, 1917, a further contract was made for 500 of the same type and this was cancelled on Oct. 2, 1917.

On the latter date the company received a contract for 4000 of the 220-hp. Hispanos (Type F), which were the 150-hp. engines geared to high speed.

This contract was cancelled on Nov. 13, 1917, and was replaced by the contract of that date for 1000, 150-hp. Hispanos (Type A). On Nov. 20, 1917, the company received a contract for 3000, 300-hp. Hispanos (Type H) which was modified by two contracts in the present year postponing the delivery dates, the second of which (May 11, 1918) provided for the manufacture of the 300-hp. Hispanos in Long Island City and for a further postponement of deliveries.

On Feb. 2, 1918, another contract was awarded to the company for 1000, 150-hp. Hispanos (Type A). On Feb. 25, 1918, a contract was made for 1000 Type E or I Hispanos; and on May 25, 1918, another contract for 1000 Type E or I Hispanos was placed with the same company.

Type E is Type A modified as to connecting rod construction, magneto drive construction, and the piston design so as to make possible the carrying of a higher compression and thereby greater power, that is, 180-hp. at normal speed. Type I is 150-hp. and has all the improvements of Type E except the big compression.

The 300-hp. Hispano (Type H) was in an experimental stage last November and the first deliveries now due of Type H are in October. Under the contract of July 31, 1917, for 500 150-hp. Hispanos deliveries were to begin ninety days from date of contract and determination of final details.

Subsequently, Oct. 25, 1917, was fixed as the date from which the ninety days were to be reckoned and the deliveries were actually completed in February. Under the contract of Nov. 13, 1917, for 1000 150-hp. Hispanos, deliveries were to be completed in April, 1918, and with the exception of one motor they were completed in May, 1918. Under the contract of Feb. 2, 1918, for 1000 150-hp. (Type A) motors, deliveries were to be completed in July and, by the end of July, 988 had been delivered.

The Type A or the 150-hp. Hispano, has been used for the advanced training plane known as the JN-4H. The 180-hp. Hispano is adapted to single-seater pursuit planes such as the Spad or the SE-5 and is now in course of delivery.

On July 25, 1917, the Wright-Martin Aircraft Corp. submitted to the Aircraft Production Board a schedule for proposed deliveries of the Hispano-Suiza motor "of either direct driven or geared specifications" amounting to approximately 7000 over and above the deliveries then due on the French contract.

The offer was on the condition that "orders are placed with us or some definite arrangement made for same at once, so that we have sufficient assurance to warrant us in making the necessary capital expenditures and providing further that arrangements can be made for the Government to furnish us

with the necessary working capital in excess of our present resources."

There is ample basis for the conclusion that had there been a sustained effort to produce single-seater pursuit planes, and with this definite purpose adequate orders had promptly been given so as to justify the provision of additional facilities by this company and the speedy utilization of its highest capacity, engines for these pursuit planes could have been delivered in quantity through the winter and spring and large numbers of these engines would have been available by July 1, 1918, in addition to the production needed for advanced training planes and without interfering with the development of the high-power Liberty motor. This is aside from what could have been accomplished through timely arrangements made for production by other companies.

Rotary Engines

In the cable of Oct. 5, 1917, in General Pershing's name, it was recommended that "no rotary engine single-seater pursuit aeroplane" should be built here to be sent to Europe. On Nov. 8, 1917, Brigadier-General Saltzman, Acting Chief Signal Officer, requested the opinion of the Joint Army and Navy Technical Board as to the extent to which rotary motors should be included in the building program for air-planes and engines in the future.

In response, the Joint Army and Navy Technical Board replied that as "the tendency in the design of fighting air-planes" appeared to point toward two-seater fighters of maximum power, it was believed that in the general building program for the coming year "rotary engines should be considered of secondary importance."

It was added, however, that in order "to anticipate improvements in the art or changes in the military situation" it was desirable that the art of building rotary engines be retained in the United States, and that for this purpose "the organization skilled in rotary engine production be preserved."

Referring to the schedule of production of rotary engines, the board expressed the opinion that the order for 2500 80-hp. LeRhône engines was larger than was necessary to preserve the art and that this order should be reduced to the minimum number that would accomplish the purpose, and it was further recommended that steps be taken to preserve the possibilities of production of the 160-hp. Gnome engine. The immediate occasion of this inquiry was the pending question whether the Government should purchase the plant of the General Vehicle Co. of Long Island City, which was manufacturing Gnome motors.

This purchase was made but the manufacture of Gnome motors was continued at this plant for a time. In May, arrangement was made for the use of the plant by the Wright-Martin Aircraft Corp. in the building of 300-hp. Hispano-Suiza. Additional orders have been placed for LeRhône engines. The rotary engines have been used for advanced training planes.

The Liberty Engine

In the latter part of the year 1914 the Packard Motor Car Co. decided to go extensively into the development of air motors. It had received one of the Mercedes motors, used by the Germans in their airplanes, which had been imported in a racing chassis.

Taking certain features from that motor and from other motors, an engine was designed in 1915, a duplicate of which was used in a racing car. This engine developed 140 hp. at 3600 r.p.m. Another model, with greater power, was completed in December, 1916, and was also used in a racing car; this was rated at 200 hp. at 2180 r.p.m. It was described in a pamphlet exhibited at the Aeronautical Show in New York in January, 1917, as "The Packard Aircraft Engine," exhibited as a "stimulant to the new aviation industry."

The work of developing these motors had been under the direction of J. G. Vincent, then vice-president of the Packard Motor Car Co. in charge of engineering. In the latter part of May, 1917, Mr. Vincent took his drawings to Washington for the purpose of laying before the Government the plan of the Packard company to manufacture these engines in large quantities through enlisting the aid of other automobile manufacturers who had experience in high-grade motor work.

Mr. Vincent met Mr. Deeds, Mr. Waldon and others. The design was not deemed to be adequate for the needs on the Western Front and it was necessary to increase the horsepower of the motor with lighter weight per horsepower. Mr. Vincent worked in Washington in conjunction with Mr. E. J. Hall of the Hall-Scott company, making sketches for the purpose of improving the motor, and in a few days a new motor was designed embodying to a considerable extent the engineering features which had been developed during the past two years of experimental work.

The first efforts were directed to the development of an 8-cylinder motor, and in a few days Mr. Vincent returned to Detroit, taking the Washington sketches for the purpose of having a wooden model made by the Packard company, and this was done.

At the request of the authorities, Mr. Vincent was loaned by the Packard company in order that he might take charge of the Engineering Division of the Aviation Section of the Signal Corps. The Packard company made a full-sized operating model, which was sent to the Bureau of Standards on July 3. Later, about August, 1917, the production of an 8-cylinder engine was postponed and the immediate production of a 12-cylinder engine of the same type was decided upon.

In developing the design for the purpose of quantity production various difficulties were encountered. Aside from minor changes found to be necessary in the course of production, the crankshafts, connecting rods and bearings in the first thousand engines were too light, creating a dangerous condition.

The crank shafts, connecting rods and bearings had to be redesigned. It was also found to be advisable to change the system of lubrication and, again, it was difficult to obtain a development of radiators that were suitable for a motor of this size. As late as June 25th of this year, General Pershing's cable described a series of defects in the motors which had been shipped abroad and these, it is understood, were speedily remedied.

It now appears to be conclusively established that the Liberty engine is a great success for observation and bombing planes, and for this purpose it has found high favor with the Allies. It is too heavy for the lighter pursuit planes. The following statement furnished by the British Ambassador with respect to British opinion of the Liberty motor, was received on June 22, 1918:

No bench tests have been applied to the Liberty Engine in England but tests in the air, similar to those applied to British engines, have been carried out on a D.H.9-A with satisfactory results. Bench tests in France were observed by members of the British Technical Department and were satisfactory. The tests carried out in France were the Standard French tests, and do not differ very largely from the Standard English tests, except that the power output was taken with a fan brake instead of a Froude Water Brake, as generally used in England. The results were excellent, except that the design of crankshaft and connecting rod was found to be faulty, but this was well known and had been modified in the United States. The carburetion was also found to be unsatisfactory but is now in course of being remedied.

The official opinion of the Liberty Engine is that it is an engine which, with a natural development in the perfecting of its details, will prove reliable and up to the power and consumption standards that have been claimed. It is eminently suited for bombing and reconnaissance aeroplanes, but not for fighting aeroplanes. The number of engines actually ordered for the British Government is 980, but 4,500 are required by the end of the year. The British Government would have prepared to place an order for 3,000 at once, but, at the desire of the American Government, the order was limited to 980, the number which was allocated for delivery up to the end of June. Up to date, 205 engines have been delivered from the Works.

The following is the text of a telegram received from the Air Ministry on June 8th:

The British technical authorities have reported to the air minister that the liberty engines have now been subject to sufficient air experiment in England to warrant confidence in this engine. Excellent results have so far been obtained which place the engine at once in first line of high powered air engines. Naturally service experiment in the field is still to be obtained but the Liberty engine will be a most valuable contribution to the Allied aviation programme and the United States should develop production with every confidence.

The following further statement was supplied by the British Air Ministry, under date of Sept. 27, 1918:

No severe bench tests on the Liberty Engine were carried out in England, owing to the extensive tests in America.

The only bench test in England was one short test, at nine-tenths power, for data re oil and fuel consumption. The result was quite satisfactory.

One engine was stripped after 100 hours flying and was found to be in good condition.

Tests in the air have been carried out in de Havilland 9-A and de Havilland 10, machines. In these the engines have performed uniformly satisfactorily.

The performance of the Liberty Engine is at least as good as that of the Rolls-Royce in identical machines. The information officially expressed four months ago, that the Liberty Engine would prove satisfactory in service, is wholly confirmed.

The facts as to production will be given later.

FIFTH. SELECTION OF CONTRACTORS AND DISTRIBUTION OF WORK

Selecting of Contractors

For engines to be used in training planes, there were orders (to June 30, 1918) for 7950 OX-5s distributed among the Curtiss Aeroplane & Motor Corporation, the Willys-Morrow and Willys-Overland companies. Orders for the Hall-Scott engines (2250) were placed with the Nordyke & Marmon Co.

and the Hall-Scott Motor Co. The General Vehicle Co. received an order for 111 Gnome engines (100 hp.), and the unfilled portion of this order was taken over by the Aeronautical Engine Co., which also received certain additional orders for engines of the same type, when the latter corporation was organized to conduct operations at the plant of the General Vehicle Co. after its purchase by the Government.

The Union Switch & Signal Co. had orders for 2500 Le-Rhone engines (80 hp.). The orders for the Hispano-Suiza engines placed with the Wright-Martin Aircraft Corporation have already been sufficiently detailed (*ante*, p. 96). In addition, orders for 450 of the Lawrence engine (28 hp.) were placed with the Excelsior Motor Manufacturing Co., and an order for 2000 Bugattis was given to the Duesenberg Motor Corporation.

In the summer and fall of 1917 contracts were entered into for the manufacture of 22,500 Liberty motors, as follows:

August 31, 1917, Lincoln Motor Co.	6,000
September 4, 1917, Packard Motor Car Co.	6,000
September 7, 1917, Nardyk & Marmon Co.	3,000
September 11, 1917, Trego Motor Co.	500
November 22, 1917, Ford Motor Co.	5,000
December 11, 1917, General Motors Corp.	2,000
Total	22,500

The contract with the Trego Motor Corporation was subsequently cancelled,* only one engine being delivered.

For the production of elementary training planes of the type known as JN4-D, reliance was placed chiefly upon the Curtiss Aeroplane & Motor Corporation, which had already made planes for the British Government. Substantial orders were also given to the Springfield Aircraft Co. and the Canadian Airplane Co., Limited (of Toronto). A number of small orders were placed from time to time with various concerns. The total orders to June 30, 1918, were for 3975 of the JN4-D type.

The orders for the Standard-J training planes were distributed among the Dayton Wright Airplane Co., the Fisher Body Corporation and the Standard corporations (Standard Aero Corporation and Standard Aircraft Corporation). The total orders were for 1600 of this type.

For advanced training planes, there were orders given to the Curtiss Aeroplane & Motor Corporation (to June 30, 1918) for 919 JN4-H and 479 JN6-H; to the Thomas Morse Aircraft Corporation (for 100 S4-B and 400 S4-C), and to the Breese Aircraft Corporation (for 300 Penguins).

With respect to both elementary and advanced training planes there were also various orders for spare parts.

In service planes, the production of the DeHaviland-4s was pivoted upon the work of the Dayton Wright Airplane Co. in connection with the designing of the plane for American production, as hereafter explained. There were contracts for 8500 of the DH-4s as follows:

Dayton Wright Airplane Co.	4,000
Fisher Body Corp.	4,000
Standard Aircraft Corp.	500
Total	8,500

The contract for the Bristol fighters (2000) was given to the Curtiss Aeroplane & Motor Corporation.

In view of the exigency, it was inevitable that the responsible officials of the Signal Corps entrusted with the duty of aircraft production should exercise a broad authority, virtually unhampered by restrictions, in the selection of contractors.

The Aircraft Board, in which the responsible Army officers sat as members, afforded a useful opportunity for the comparison of views, but not a legal, and only to a limited extent, a practical, check. There have been numerous complaints from individuals and corporations who sought contracts unsuccessfully. The extent to which activities were centered at Dayton, the profitable contract promptly given to Colonel Deeds' former business associates, and the preference of a small group of manufacturers in the allotment of the large contracts, created a feeling of distrust which finds frequent expression in the record of this inquiry.

There could be no well-founded objection to a well-directed effort to standardize products for production in large quantities under conditions favoring the most economical and efficient work. So far as orders for production of planes in small quantities and various spare parts are concerned, to give an adequate statement of the facts with respect to the companies who received, or which asked and were refused, contracts would require a great variety of detail which it is impracticable to set forth.

It does not appear that in the award of these contracts there was adherence to any clearly defined principle. It is sufficient to say that in many instances the parties complain-

ing have no ground for their complaints, save that others in no better situation obtained what the complainants were denied.

For, while offers or requests of some manufacturers went unheeded because of alleged lack of proper facilities or of assured financial ability, in other cases contracts were made with parties equally destitute of adequate resources. Among those whose facilities were apparently adequate, some were taken and others were left.

But aside from any question of discrimination between manufacturers, it is obvious that the exigency demanded that important and needed sources of supply should not be neglected, and in this connection, without attempting to make a comprehensive statement of other available resources, the case of the Singer Manufacturing Co. deserves special attention.

Singer Manufacturing Co.

While this company had no experience in the building of airplanes, it had perhaps the largest plant in the country for cabinet work, and one of the largest veneer plants, and its facilities available for the processes demanded in aircraft production were hardly excelled in the country.

As Colonel Waldon testifies, "There was every reason why they should be successful in airplane manufacture." The officers of the company were not seeking contracts but they offered its facilities to the Government, and these were not utilized. As early as July 14, 1917, Mr. Waldon of the Aircraft Production Board requested an interview with the vice-president of the Singer Sewing Machine Co., and this was had. Later, representatives of the Singer company visited the plants of the Curtiss company, the Dayton Wright company and the Canadian Airplanes, Ltd., of Toronto, and an interview was then had with Mr. Deeds and Mr. Waldon, on August 14.

Up to that time, the manufacture by the Singer company of 3000 training planes had been under consideration, but it was then suggested that it should build 1000 service planes of the DeH-4 type. Before undertaking this work, the representatives of the Singer company desired to examine the sample DeH-4 at the plant of the Dayton Wright Airplane Co. The letter of introduction to that company, however, revealed the fact that the whole proposition was still very indefinite. The letter (Aug. 15, 1917) stated:

We are asking the Singer Sewing Machine Co. to conduct such investigations as is possible while we are making up our minds as to the part of our program they are to fulfill. When they were here yesterday we suggested that they should help in the DH-4 production. This is not definitely settled, and they may be given some other part of the program, but we would like to have them given the privilege of an opportunity to study the details of the DH-4, inasmuch as it represents the latest type of barge war machine from abroad.

On receiving this letter, the vice-president of the Singer Company telegraphed Mr. Waldon that it was so indefinite that the trip would be postponed until it was decided whether is was desired that they should undertake the building of the DeH-4. To this Mr. Waldon replied, under date of Aug. 16, as follows:

We are promptly in receipt of your telegram about the indefiniteness of our letter of August 15th. Since your visit we have received a cablegram which indicates that there will be a very important change in our program, in all probability causing us to change the type of machine you would build. This was the reason I stated in my answer that it was not definitely settled that you would build the DH-4. It will be in your hands, however, whether you go to Dayton and look over the DH-4 as a sample of an up-to-date war machine. The one we have in mind now that we would ask your assistance upon would be quite a little larger than this.

On Aug. 17, Mr. Waldon telegraphed "change in program will probably make it necessary to assign a type other than DH-4." On Aug. 20, the Singer Company informed Mr. Waldon that they had decided to postpone their trip to Dayton "until it is more definitely settled what you wish us to do for you." In a postscript to this letter it was stated that the Singer Company had been requested by the British Government to duplicate their order from that Government for certain airplane parts (universal joints), and they asked whether there was any objection to their undertaking this additional work.

An answer was received on Aug. 23, that this was entirely satisfactory. This additional work for the British Government required the services of perhaps 100 persons, and left the Singer Company quite free to undertake the making of planes for the Government, but no further word was received and no order was given to the Singer Company. In the light of the correspondence, no explanation has been given of the failure to enlist its important resources for the purpose of aircraft production.

Engel Aircraft Company, of Niles, Ohio.

In view of the former connection of Mr. Harry E. Baker, the brother of the Secretary of War, with the Engel Aircraft

*It is understood that it has been taken over by the Ordnance Department, for tanks. It is canceled so far as its relation to aircraft is concerned.

Co., the facts with respect to its organization and its contracts with the Government should be set forth.

The company was organized about August, 1917, under the laws of Ohio. Mr. Harry E. Baker testifies that it was originally intended to have a capital stock of \$3,000,000 (preferred \$1,000,000 and common \$2,000,000), but this was subsequently reduced to \$1,500,000 (preferred \$500,000 and common \$1,000,000). Mr. Harry E. Baker, of Cleveland, was president and general manager. His associates in the organization of the company were Mr. Engel, vice-president and production manager, and Mr. Patterson, secretary and treasurer.

Mr. Baker had taken an option in the spring of 1917 for the plant at Niles, Ohio, formerly owned by the Engel Airplane & Motor Co., and this was taken over by the new company, which, in effect, issued its preferred stock therefor, at a cost of about \$225,000. The remainder of the preferred stock was sold for cash. The preferred stock was entitled to seven per cent cumulative dividends and, as Mr. Baker states, was to be retired at par before the common stock participated in earnings. The common stock was issued to Mr. Baker and his associates for services in promotion. As an officer of the company, Mr. Baker received a salary at the rate of \$7,000 a year.

On Oct. 9, 1917, the Aircraft Board recommended that an order be placed with the Engel Aircraft Co., for spare parts for 100 JN4-D training planes, at the aggregate price of \$80,827.80. At the meeting of the Aircraft Board on Oct. 19, 1917, it was recited that the Equipment Division had recommended that a larger order be placed with the Engel Company, and the Board thereupon rescinded its resolution of Oct. 9, and recommended that an order be placed with the Engel Company for spare parts for 700 JN4-D airplanes at a total cost of \$585,077.50.

Following this contract for 700 sets, Mr. Baker states that there were further orders from the Government during his connection with the company for 200 sets of spares for JN4-Ds, 200 sets of spares for JN4-Hs, and another order of 100 sets of spares for JN4-Ds, the aggregate orders being for 1200 sets of spares at a price of about \$1,000,000. Mr. Baker testifies that he ceased his connection with the Engel Company on Jan. 21, 1918.

The Secretary of War testifies that either before or after our entry into the war his brother (Harry E. Baker) asked him whether there was any reason why he should not go into the manufacture of a certain flying boat for the Navy, in association with one Engel. The Secretary told him that he knew of no reason why he should not.

Later his brother informed the Secretary casually that they were going to make airplanes, and asked if the Secretary objected. The Secretary replied that he had no right to object, but did not wish to be consulted about it; that he had nothing to do with it. Later, the Secretary discovered that the Engel Aircraft Co., of which his brother was president, had a contract with the Government, which was not a competitive contract, but one which had been given upon an inspection of the facilities of the aircraft company.

The Secretary sent for General Squier and asked for the facts. The Secretary regarded the situation as intolerable and directed that the contract should be cancelled. Thereupon it was immediately cancelled by telegraph and arrangements were made, through Mr. Eugene Meyer, Jr., (acting for the Secretary) for the separation of Mr. Harry E. Baker from the company.

The Secretary thought it was just that his brother should be paid on the basis of the value of any services he had rendered, but that his complete separation from the company was necessary before a contract should be regarded as possible.

Mr. Harry E. Baker testifies that, in January last, he was informed by telephone that all of the contracts of the Engel Company had been cancelled; that he immediately went to Washington and had an interview with Assistant Secretary of War Crowell, who told him that his association with the aircraft business was embarrassing to the Secretary of War, and that he should retire from it.

He said that he had no desire to furnish cause for embarrassment, and accordingly, after an interview with Mr. Meyer, he turned back to the treasurer of the company all of the stock that he had in his name and resigned as president and general manager.

Mr. Baker testifies that the company paid him nothing for his stock. In addition to the payments of salary which, according to his testimony, he had received for two months at the rate of \$7000 a year, Mr. Baker says that he was paid on his retirement the sum of \$15,000 in consideration of the services that he had rendered.

Being assured that the separation of his brother from

the company had been effected, the Secretary notified General Squier that the capacity and merits of the company were the only matters to be considered. All the contracts were immediately reinstated on the same terms. Subsequently an additional order was given to the Engel Company for 500 sets of spares for DeHaviland-4s, at an estimated cost of \$2,275,000.

Distribution of Work.

Quite as important as the selection of contractors and the development of adequate sources of supply, was the distribution of work so as to insure prompt and efficient production. Each type of plane requires special preparation and the demands of varied sorts of work may easily be mutually restrictive and demoralizing. A conspicuous instance of this is furnished in the case of the Standard Aircraft Corporation.

This company with its predecessor (the Standard Aero Corporation) had the unusual features of being a manufacturing corporation under the direction of two lawyers, Harry Bowers Mingle and Max J. Finklestein, of the firm of Mingle and Finklestein, of New York City. It is unnecessary to review the financial history of the two Standard corporations, with their plants at Elizabeth and Plainfield, New Jersey.

It is sufficient for the present purpose to say that from the time of the organization of the Standard Aircraft Corporation in November, 1917, it has been the operating company, except that recently the Standard Aero Corporation has been availed of, and it has taken the plant at Plainfield for the purpose of handling fixed-price orders, the cost-plus contracts being in course of performance at the large plant at Elizabeth.

Both these corporations are controlled by Mitsui & Company, a leading Japanese firm, which holds all the preferred stock and a majority of the common stock of each company. The orders which have been given by our Government to one or the other of these Standard companies exhibit an extraordinary range of types embracing training planes of the Standard-J type, six machines and spares of the JR-1B type for the Post Office, advanced training planes of the M-Defense type, four Capronis, the assembly of Handley-Page planes, five hundred DeHaviland-4s, as well as flying boats for the Navy and various orders for small parts.

The effect was to put in this plant almost every variety of airplane work, a proceeding which has no justification from a production standpoint. Mr. Charles H. Day, the chief engineer of the standard companies, whose ability is generally recognized, frankly admits the serious disadvantage of this multiplicity of orders. He says:

There is a natural amount of confusion in having a multiplicity of those parts. . . . The engineering personnel is limited by the number of different machines you have to produce, and the executive force is limited by the same amount. The physical layout of the factory itself is very seriously affected. . . . We have on the HS boat job, made entirely our own drawings. It was out of the question to work to the drawings which were supplied us and we therefore redrew the entire job. That occupied a great amount of time of the drafting room and the engineering departments of the Standard Aircraft. Then a great amount of drawing has been necessary on the DeHaviland-4, it being impossible to get VanDyke drawings from the Signal Corps, and we have attempted to draw up a great deal of that machine, and we have redrawn in its entirety the Handley Page machine. That involves the engineering department and the drafting department and the bill of materials department sometimes known as the specification department which is one of the most important we have, inasmuch as under the present regulations we are not allowed to purchase material except we bill the material. The approvals officer will not approve the materials except on the basis of a bill of materials supplied, and making the bills of materials and completing the drawings on all these different machines has been extremely difficult.

Q. Have you had in your drawing department the HS boats for the Navy, that is the seaplane, the Handley Page planes and the DeHaviland planes, all being worked out at the same time? A. Yes, sir.

On the same point, Mr. Day again testified:

The order for the DeHaviland-4s is a very small order comparatively. . . . If we were to turn over our plant entirely into building the 500 DeHaviland-4s and had a go-ahead on 500 DeHaviland-4s, it would not last very long. We expected early in this year and were preparing to take over a large order for Capronis. That was before we had the DeHaviland machines, and it was supposedly to be a thousand Capronis. That was a fair sized order, and we expected we would have that alone and nothing else. But that was withdrawn, and the order for 700 sets of spare parts for the Bristol and 1500 sets of spare parts for the DeHaviland-9 was given us, and that was a pretty fair sized order. That in itself would have been sufficient for some length of time, but both of those orders were recalled. The interference, so far as spare parts of machines is concerned, would have been less than the interference caused by two orders for complete machines. It has been impossible for us to obtain a large enough continued order to actually know what we were going to do and to prepare for doing it.

Criticisms upon the management of the corporation do not excuse such a state of affairs. If a manufacturing corporation is to be entrusted with work, it is manifest that it should be given the work it can handle efficiently; and if

its efficiency is distrusted, there is still less reason for embarrassing it with confusing orders.

On the other hand, if it is deemed capable of successful production it should have a suitable opportunity to develop it. The effect of placing such an assortment of orders, coupled with the difficulties besetting production in this new industry, has not only interfered with production, but has promoted waste, made it exceedingly difficult to maintain proper cost accounts, and has confused responsibility for delays.

Other illustrations of a poor distribution of work might easily be given; the result of it is that one part of the Government's program has stood in the way of another.

SIXTH. THE COURSE OF PRODUCTION.—DELAYS.— MISLEADING PUBLIC STATEMENTS

It is not deemed to be necessary to review in detail in this report such delays as occurred in the delivery of training planes and engines therefor. As early as Feb. 16, 1918, 1733 had been delivered of the JN4-D and 683 of the SJ-1 elementary training planes. As already stated, 2972 of the JN4-D had been delivered by June 30 and the total order for the SJ-1 (1660) was completed by May 11, 1918. By Feb. 16, 1918, there had been delivered 1438 of the OX-5 engines and 1083 of the A-7a engines and deliveries continued from week to week.

The elementary training planes of the JN-4D type seem to have been satisfactory. In connection with this phase of the execution of the aircraft program it should be said that the general average of accidents in training for all the camps in the United States, is one accident for every 3200 to 3600 hours of actual flying.

The worst school, in this respect, is one accident for every 1900 hours of flying and the best school shows one accident for every 4800 hours of flying. While it is somewhat difficult to obtain comparative statistics with respect to accidents in French and British training camps, it is believed from reports from our officers serving in the English and French schools that we have about twice as much flying per accident as either of the other nations.

The condemnation of the SJ-1 plane as dangerous, because of the Hall-Scott engine, has already been mentioned. It is to be noted that as early as Feb. 12, 1918, the Joint Army and Navy Technical Aircraft Board passed a resolution reciting the opinion of the Board "that the Standard airplane as completed with the Hall-Scott engine is not a satisfactory training machine" and recommending "that if it is necessary to make further purchases from the Standard Company of types that have been developed by them, that such machines be of the type designed for the installation of the Hispano-Suiza engine and the 150 Hispano-Suiza engines be purchased for these machines." The Standard J training plane with the Hall-Scott engine continued to be used until it was condemned in June, 1918, on General Kenly's return from overseas and after his careful examination of its operation. The order of General Kenly, under date of June 6, 1918, is as follows:

1. Due to the shortage of training type airplanes in the past it was necessary to use a certain number of Standard J-1 airplanes for training as filler-in until there were sufficient JN-4 machines manufactured for all schools.

2. At the present time there are sufficient JN-4 machines in storage to entirely replace all Standard machines in use. The Director of Military Aeronautics therefore desires that no more Standard airplanes be used in flying training and that steps be taken at once to entirely replace the Standard J-1 machines now in use by JN-4 airplanes. The Standard machines can be utilized in Mechanics' Training Schools, Ground Schools and any other schools where it is not necessary that they be taken into the air.

With respect to advanced training planes, it may be said that by Feb. 16, 1918, 60 had been received of the S4-B and 105 of the JN4-H. The delivery of Penguins did not begin until the middle of April, and of S4-Cs until May. There had been delivered by Feb. 16, 1918, 121 of the Gnome (100 hp.) and 444 of the Hispano (150 hp.) engines. Deliveries of the Lawrence (28 hp.) began in March and of the LeRhône (80 hp.) in May, 1918.

Service Planes

As already stated, the program during the period under consideration and until recently has been practically limited to the DeHaviland 4s and the Bristol Fighters.

The DeHavilands

The contracts for these planes, after the substitution of DeH-4s for DeH-9s, called for 8500 DeH-4s, viz.: Dayton Wright Airplane Company, 4000; Fisher Body Corporation, 4000; Standard Aircraft Corporation, 500.

Under the first contract with the Dayton Wright Airplane Company (dated Sept. 7, 1917), deliveries of the DeH-9s then

provided for were to begin in November, and the entire 2000 were to be delivered by the end of June, 1918. Under the modified contract (Jan. 17, 1918), for 1000 DeH-4s and 3000 DeH-9s, deliveries were to begin in January and to be completed by the end of July, 1918.

Under the final contract (April 1, 1918), substituting 4000 DeH-4s, the latter were divided into two lots of 2000 each, the first lot for immediate production to be delivered by Aug. 1, 1918, and the remainder to be delivered as order.

The first DeH-4 was shipped from the plant of the Dayton Wright Airplane Company on Feb. 5, 1918. It was intended for the American Expeditionary Forces in France, but it was not completely equipped; it did not have any bomb gear that would work. On Feb. 14, 1918, the following telegram was addressed by Mr. Talbott to Colonel Deeds:

Wire received reference Secretary Redfield and Dr. Stratton. Major Shepler advises first one hundred DeHavilands to remain in this country. If so, will you recall plane shipped for foreign shipment, allowing us to substitute plane completely equipped. Progress here encouraging.

However, the plane already shipped, was not recalled. The transport containing it sailed on March 22 and, on account of engine trouble in the Azores, it did not reach Europe until May 4.

Nine additional DeH-4s were shipped by the Dayton Wright Airplane Company in February for the use of various fields; two on the 15th, one on the 16th and two on the 17th, intended for Gerstner Field in Louisiana; one on the 21st for McCook Field (which was sent to South Field); one on the 22nd for the Fisher Body Corp.; one on the 23rd for the Standard Aircraft Corp., and one on the 25th for McCook Field. Four were shipped in March; two for Gerstner Field on the 9th and 12th, one for McCook Field on the 10th, and one on the 21st was delivered to the Property Officer at the Dayton Wright Airplane Company.

There were no shipments for the American Expeditionary Forces between Feb. 5th and April 3, 1918, when four were shipped; four more were shipped on April 14th and four on April 22nd, and there were no more shipped for use abroad until May 2, 1918. That is to say, up to May 2nd there had been thirteen DeH-4s shipped for our forces abroad.

It was in May, 1918, that what may properly be called quantity production of DeH-4s began. By the end of that month 193 DeH-4s, and by the end of June, 529 DeH-4s had been delivered by the Dayton Wright Airplane Company. Of these 529, it appears 381 had gone to ports of embarkation, 116 to the Navy and 32 to various destinations in this country, including training fields.

On June 25th, advices were received that there were serious defects in the planes which had been received abroad. At the meeting of the Aircraft Board on July 31st Colonel Arnold stated that all planes shipped to Europe by the Army which were found on arrival to have weaknesses were rebuilt at the aircraft production centers. At the same meeting, Mr. Potter stated that the DeHaviland planes for the Navy which had been shipped from the factory but were not yet floated should be sent back to the Dayton Wright Company to be rebuilt.

From June 30th to Oct. 11th, 1918, the Dayton Wright Airplane Co. delivered 1320 DeH-4s, making 1849 in all to the latter date.

In the contract with the Fisher Body Corporation (Nov. 6, 1917) provision was originally made for 3000 DeH-9s, the deliveries to be completed before July 1, 1918. For these there were subsequently substituted 4000 DeH-4s, of which 2000 were to be delivered by Sept. 1, 1918—afterwards extended to Nov. 1, 1918—and 2000 more at dates to be fixed. Up to June 30, 1918, no deliveries of DeH-4s had been made by the Fisher Body Corporation. This company got into quantity production in August and had delivered 452 up to Oct. 11, 1918.

For the order of 500 DeH-9s placed with the Standard Aircraft Corporation (Jan. 26, 1918) there were eventually substituted 500 DeH-4s by the contract of March 28, 1918. No deliveries had been made up to June 30, 1918, and only 49 had been delivered up to Oct. 11, 1918.

The total deliveries of DeH-4s, to Oct. 11, 1918, amounted to 2350. Of these, 1617 had been floated, 388 were at ports or in transit, 177 had been shipped to camps and training fields, and 168 are described as being for 'manufacturers and miscellaneous.'

Bristol Fighters

The contract with the Curtiss Aeroplane and Motor Corporation called for 2000 Bristols to be delivered by Aug. 31, 1918.

There was no definite release for production until February and then only to the extent of 25 machines. 400 were released for production in the latter part of March and 400 more on

April 24th. As already stated, only 27 were delivered in all, and the order was cancelled in July.

Liberty Engines

The deliveries were to be completed as follows:

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
Lincoln Motor Co.	5	80	160	275	701	1400	1900	1490					
Packard Motor Car Co.	50	200	500	800	1000	1200	1200	1050					
Nordyke & Macdon Co.	25	125	550		200	800	800	800					
Ford Motor Co.						200	800	1000	1070	1000	1000	500	400
General Motors Co.						25	125	250	300	400	500	400	

These were the actual deliveries:*

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Total
Lincoln Motor Co.				7	21	134	106	309	494	701	1022	2737		2737
Packard Motor Car Co.	1	25	43	96	153	314	439	556	724	543	970	3864		3864
Nordyke & Macdon Co.								0	18	24	117	157		157
Ford Motor Co.								53	197	459	1212	1868		1868
General Motors Co.								130	244	398	371	1013		1013
														9689

The total deliveries of Liberty motors (US-12) to Oct. 11, 1918, amounted to 9689, of which 6895 were for the Army and 2794 for the Navy. Of those for the Army, 3555 had been floated, 456 were at ports or in transit; and there had been delivered 990 to Allied Governments, 260 to flying fields, 1429 to manufacturers, etc., the remainder, or 205, being turned over to the Navy.

Contracts have recently been made for the production of the Liberty 8 (US-8), but no deliveries had been made to Oct. 11, 1918.

Misleading Public Statements

In the face of the delays in production a series of misleading public statements were made with official authority. While these statements were authorized by the Secretary of War, he states that they were issued in reliance upon information furnished by the Chief Signal Officer, General Squier, and by Colonel Deeds, who were acquainted with the actual conditions. It is unnecessary to review the delusive predictions and exaggerations contained in these utterances.

But particular attention should be directed to the official statement released for publication in the papers of Feb. 21, 1918, which contained the following:

The first American built battle planes are to-day en route to the front in France. This first shipment, though in itself not large marks the final overcoming of many difficulties met in building up this new and intricate industry.

This statement had its origin in a conversation between Colonel Deeds and a representative of the Committee on Public Information a week or two before the completed statement was issued. A draft was first prepared and submitted to Colonel Deeds, who examined it and made some corrections. The statement contained in the paragraph above quoted was not only left unchanged but was the subject of special inquiry.

Colonel Deeds was asked what was meant by the "first shipment," and he replied, "They are on the water now, on the way to France." He was then asked, "How many?" and he answered, "I do not know, but I do not think more than ten." The statement in its final form was then presented to the Secretary of War, who permitted it to be issued upon the understanding that it had been verified by General Squier and Colonel Deeds.

At the time this statement was issued (Feb. 20) only one plane had been delivered for shipment to the American Expeditionary Forces, and while this had been shipped from the factory on Feb. 5, it did not leave the United States until March 22. The only other service planes which had been delivered were five DeH-4s, which had been shipped for use at Gerstner Field, Louisiana. No additional shipments of airplanes for the use of our forces abroad were made until April 3. Actual production in quantity did not really begin until May.

Colonel Deeds admits that this statement was brought to him before its publication, and that he went through it. He examined it minutely enough to correct with his own hand one of the paragraphs following that above quoted, which gave the number of men required on the ground for every plane in the air, his correction making it 46 instead of 45.

Colonel Deeds denies, however, that he said in response to the inquiry upon the point that the battle planes were "on the water now, on the way to France." That he did make this statement is testified to directly and unequivocally by John W. McConaughy and Merlen E. Pew, representing the Committee on Public Information.

When Colonel Deeds was examined as a witness before the Committee on Military Affairs of the Senate, on April 2, 1918, he was asked this question and gave this answer:

*There are slight discrepancies between the factory records and the Government reports, and the latter apparently based on actual receipts are used in this tabulation.

Senator Wadsworth. Did you see, or do you know whether any other responsible officers in your Aviation Section of the Signal Corps saw the statement given out by Secretary Baker on February 21st before it was published?

Colonel Deeds. No, sir, I did not see it. I do not know of anybody seeing it.

Colonel Deeds admits giving this testimony. He testified that he did not then recall the paper in question.

Colonel Deeds further testifies, in explanation that when the paper was before him, his information was that "four planes were on the cars en route to France," and that it later developed that only one was sent and the others were diverted to Lake Charles, that is, to Gerstner Field, for tests on radiators.

The shipments to Gerstner Field, however, had been made directly from the Dayton Wright Airplane Co. on Feb. 15, 16 and 17, and these planes had not been shipped from the factory for the American Expeditionary Forces. There is evidence, also (*ante*, p. 113), that on Feb. 14 Mr. Talbott had telegraphed to Colonel Deeds that Major Shepler advised that first one hundred DeHavilands should remain in this country and asking on this assumption for the recall of the one plane "shipped for foreign shipment," so that another could be substituted "completely equipped."

There is no question but that this grossly misleading statement was published on the authority of Colonel Deeds and that the Secretary of War relied upon the fact that it had Colonel Deeds' approval in giving it his official sanction. While this conduct of Colonel Deeds does not come within the scope of the Criminal Code, it deserves the prompt attention of the military authorities.

General Squier testifies that he had nothing to do with the statement that was issued for publication on Feb. 21 and that he did not know of it before it was published.

He testifies that when it was brought to his attention he did not regard it as a proper statement to have been sent out, but that he did not institute an inquiry to ascertain who was responsible for it. It is evident that the matter called for immediate investigation and for suitable disciplinary measures, but no steps were taken either for correction or punishment.

The Secretary of War states that the responsibility for the statement clearly rested with General Squier and Colonel Deeds, and that he did not learn of the inaccuracies of the statement until his return from Europe in the latter part of April.

There were earlier statements of a delusive character as to the progress of aircraft production, but the particular statement to which attention has been called was inaccurate in its specific statement of facts, and its misleading character was obvious to anyone having knowledge of the actual conditions.

SEVENTH: CAUSES OF DELAY IN PRODUCTION.

First: Lack of knowledge and experience.

This was a fundamental difficulty affecting production in all its stages. The industry was new, and there was a lack of engineers and skilled workmen. Novel problems were encountered at every step, and lack of knowledge bred indecision and confusion.

Experience in other manufacturing enterprises gave no assurance of facility in this untried field. In addition, it was necessary to develop new sources of supply of needed materials, and the difficulties of the main contractors had their counterparts in the plants of sub-contractors by various sorts of material or fabricated parts were supplied.

Second: Defective organization in the Signal Corps.

The duty of providing an adequate organization for aircraft production was left to the Signal Corps. It is quite clear that this undertaking was beyond the competency of the Chief Signal Officer, who had neither training nor experience for such a large industrial enterprise, and those who were brought to the task in his department failed to produce an organization which was adapted to meet the exigency.

The contracts were for production, and presupposed that the manufacturers should have an established design. The contractors agreed to produce the described machines in accordance with drawings and specifications to be furnished by the Government.

In order to secure production of types of planes unknown to our manufacturers it was necessary that the Government should create an engineering department which should settle the design and furnish adequate and accurate drawings and specifications. But this essential condition of achievement was not met.

Undoubtedly the lack of airplane engineers was a serious obstacle. Still, there were a few in the country who had

devoted themselves sedulously for a considerable time to the study of aviation problems, and it does not appear that there was a suitable effort to draw to the Government's service such talent as was available.

Whether or not much assistance could have been obtained in this way is a question which cannot be answered in the absence of an appropriate test. It was, however, entirely obvious that the exigency called for the most efficient organization and that to add to inexperience the lack of a suitable organization and the confusion of a divided responsibility would inevitably lead to serious delays and threaten the entire program.

There was an Engine Design Section established about July 1, 1917 in charge of Mr. Vincent, who had been engineer of the Packard Motor Car Co., but had no experience in the designing of airplanes. And this department did not have anything to do with the designing of airplanes as distinguished from airplane engines.

Captain (afterwards Lt.-Col.) Virinius E. Clark, who had had perhaps as much aeronautical experience as anyone in the Army, had been in charge of airplane designing, but he was absent in Europe with the Aeronautical Commission from June until about the first of September, 1917. On his return he resumed the work of airplane designing, and the Airplane Experimental Department was organized about Oct. 1, 1917, in charge of Lt.-Col. Clark, who was put in command at McCook Field, Dayton.

This organization continued until Feb. 6, 1918. Lt.-Col. Vincent testifies that he had been arguing for an "engineering department" with the idea that it would take entire charge of engineering as it pertained to engines and planes" and "definitely straighten out" what he thought to be "an unsettled condition."

By this he meant that "an attempt was being made to put planes into production in this country without having complete drawings or a complete understanding as to just what equipment such planes were to carry."

But for the purpose of settling designs of airplanes and furnishing drawings to the manufacturers the Airplane Experimental Department proved to be hopelessly inadequate, and the result was that it was largely left to the manufacturers themselves to work out the designs of service planes, an undertaking for which they were ill-equipped.

When the Airplane Experimental Department failed to give satisfaction, instead of strengthening it and making it adequate to the engineering work which had to be done, an additional department was created (about January 1, 1918) which was called the Production Engineering Department.

This Department was also located at Dayton, because the Dayton Wright Airplane Co., was at that place, and there the department remained until the middle of April. It was said to be its function to supply manufacturers with engineering information, drawings, specifications, etc., from which they could produce in quantity what they were to manufacture; to specify materials, to decide upon details of design, etc.

It was not, however, established merely as an aid to the manufacturer in producing according to a settled design, that is to enable the manufacturer to cope with the difficulties which were sure to arise in the course of production, but this department was largely placed in control of the airplane design itself, which the Airplane Experimental Department had failed to establish satisfactorily.

The new department was never informed or equipped so that it could perform its function adequately. It was under the general supervision of the head of the Production Department of the Equipment Division, who was inexperienced in airplane engineering or in airplane production, and this creation of another inadequate department failed to solve the difficulty.

On Feb. 6, 1918 the Airplane Engineering Department was established in charge of Lt.-Col. Vincent, who was put in command at McCook Field. Lt.-Col. Vincent at once began to direct the efforts of the new department toward getting some well known machines ready for production, rather than doing the purely experimental or research work, and he obtained permission from Mr. Potter to take the DeHaviland 9 from the Dayton Wright Co., at South Field "and put it through McCook Field."

But this new department did not have a definite function with respect to the types of service planes already under contract, that is, the DeHaviland 4 and the Bristol, and these were left apparently as before, subject to the inadequate direction of the Production Engineering Department.

The consequences are easy to trace. When the model DeH-4 was received in this country it was accompanied by the English drawings. It was necessary to re-design the plane to accommodate it to the Liberty motor.

The model was sent to the Dayton Wright Airplane Co., and this company, which under its contract was to produce in accordance with drawings and specifications furnished by the Government, appears to have undertaken the work of redesigning and making the new drawings.

These were made and the DeH-4 as re-designed was flown on Oct. 29, 1917. When, later, changes were required the company expected drawings to be furnished by the Signal Corps; the Production Engineering Department apparently expected the drawings to be provided by the company.

Rapid and successful production which demanded clearly defined responsibility could not be expected under such conditions. About Feb. 21, 1918, the Production Engineering Department having been unable to secure production, the work on the DeH-4 was virtually taken out of its hands and placed in charge of Lt.-Col. E. J. Hall for the purpose of a swift effort to get results.

Lt.-Col. Hall proceeded to get necessary information as to equipment, developed a little organization of his own, at once built three model planes (one for the Dayton Wright Airplane Co., one for the Fisher Body Corp. and one for the Standard Aircraft Corp.) and sought to remove as rapidly as possible the various hindrances to production. In this way, production in quantity was finally attained.

But this was not the perfecting of the organization, but in substance was a desperate effort outside the regular instrumentalities of the Equipment Division because those instrumentalities could not be relied upon.

With respect to the development of the Bristol, similar conditions existed. When Lt.-Col. Hall had made sufficient progress at the plant of the Dayton Wright Airplane Co. to warrant it, he turned his attention to the production of the Bristol, at the plant of the Curtiss Aeroplane and Motor Corp.

As he testifies, "they were worse than at a standstill." "It would have been easier," he says, "for me to have taken and designed the whole machine around the equipment if they had not had the material started." He found that practically all they did was to get in a row, so that the condition when I went in there was that everybody was damning everybody else." This was about April 11, 1918.

It appears that Captain Clark in the fall of 1917 began the work of re-designing in order to adapt the Bristol to the Liberty motor, and about the last of October the model Bristol with a large number of drawings was sent to the Curtiss company.

Mr. Mueller, who was the chief engineer of the Curtiss company, states that they were unable to make the plane from the drawings that "the dimensions would not check up" and that "it was impossible to get the machine together from the parts made from the details of the Signal Corps drawings."

In January, 1918, the Production Engineering Department took over the work on the Bristol, but differences with the contractors speedily arose, and at the end of January, for the purpose of reconciling these differences, a conference was held between the representatives of the Signal Corps and of the company, respectively, and it was determined that engineering decisions should thereafter be left to the engineer of the Curtiss company.

This authority apparently was exercised for two or three weeks, but opposition developed and there was no real progress. Lt.-Col. Hall took the matter up in April and an effort was made to drive through to production.

It is apparent, however, that this plane never got beyond an experimental stage, and yet 400 were released for production in March and 400 more in April. This was evidently in response to criticism of delays. But the plane as designed for the Liberty motor was doomed to failure. Had there been an adequate engineering department to settle the matter of design and make the necessary engineering tests and decisions before production was entered upon, much time and money expended in fruitless effort would have been saved.

Throughout this period the Equipment Division of the Signal Corps presented an organization with a host of sections and departments, with ill-defined functions, creating disorder and confusion rather than sustained, well directed and expert effort. There was a vast amount of lost motion.

Manufacturers were brought into contact with various divisions with overlapping powers; earnest and able scientific men, who were brought into particular sections, found themselves lacking in authority or in conflict with other sections; and uncertainty, indecision and vacillation enfeebled the entire undertaking.

Military organization was another obstacle to the rapid prosecution of what was essentially an industrial enterprise. Whatever might be accomplished by such an organization in a thoroughly understood activity, it was certainly unsuited to an entirely new industrial endeavor of this sort.

A mobile force in which men could readily be moved about, tested, elevated and deposed without regard to military rank or precedent, was absolutely required. The inherent difficulties of the situation were thus greatly increased by defective organization. No doubt, also, the swift creation of a large force of inspectors, without the qualification of experience in their line of work, not only opened the door to abuses, but to an extent retarded production.

The situation, as it appeared to Archer A. Landon (Mr. Coffin's assistant) more than six months after we had entered the war, is strikingly shown in his letter to Mr. Coffin dated Oct. 16, 1917, in the course of which Mr. Landon said:

"The lack of organization and continuity of responsibility is so apparent that success will be a miracle. If we are to be successful there must be fixed, from the Secretary of War or the Secretary of the Navy down almost to the office boy, a direct line of responsibility that will make every individual assume the absolute responsibility for the work he is undertaking and under no circumstances should any conflict of authority or responsibility occur. Industrial men of known responsibility and capacity for the particular work undertaken must be selected. They should be peculiarly fitted for the position they occupy and should be responsible for their work as in civil life.

"We men who have come here in an effort to assist you find ourselves very seriously embarrassed and justly so. We are started off to do what seems to be an important piece of work only to find that this work has been delegated to somebody else in some other department and that we are treading on other people's toes. The result is that we do not get the information we want and we do not get anywhere. They do not throw us out, but they are all adept at pulling the latest Washington game of 'passing the buck,' or else, frankly, resenting our appearance in the matter.

"Take the spruce situation as an example of dilly dallying through a lack of organization. The first I knew of the spruce situation was around the latter part of July or the first of August. At that time it was one of your great worries. The entire aircraft program was and is now endangered by the lack of ability to get spruce; and yet from that time until now, notwithstanding repeated conferences, there was nothing done on the spruce situation, either towards closing contracts or increasing production, until October 13th, when Colonel Disque was sent west on the situation; a loss of time of practically three months. If this had been your own business, the men would have been on their way west the day after the matter was first brought up. The only reason that there was no action in July was because we do not possess an organization of direct responsibility and on that account these inefficiencies are possible and they will continue to occur until such time as somebody wakes up and thoroughly organizes the work.

After giving a further illustration, Mr. Landon continued:

"This is not intended as a criticism of General Squier or the other officers, but it is intended to be a very vigorous criticism of methods of organization that make such a condition possible; and I submit to you, s.r., that, if this same condition exists in all departments and continues to exist, we might as well submit to the Germans now, because the one way you can beat efficiency is to match it with efficiency, and efficiency can only be obtained by a thorough organizing of our responsibilities and following them through to a definite conclusion, which conclusion should be the winning of the war.

Mr. Landon, leaving the aircraft work in October, 1917, returned to it in June, 1918, then becoming chief of the Production of Aircraft in the Bureau of Aircraft Production. Up to that time, the policy he had recommended had not been carried out. He testifies that he "could see practically no change in the organization in six months;" that is, prior to the new organization through the Bureau of Aircraft Production which had just been instituted.

It should be understood, of course that the complaint so emphatically voiced was not directed at the Aircraft Board, as this, as Mr. Landon stated in his letter, was "merely an executive advisory board." The responsibility lay with the officers entrusted with the duty of effecting an adequate organization for aircraft production.

Third: Lack of information as to the equipment required for Service Planes

The model DeHaviland 4 was not received until about the beginning of August, 1917, and, as already stated, it was necessary to re-design it and make new drawings. But whatever delay was due to a failure to obtain a model earlier, or to the necessity of re-designing the plane, was greatly increased by the lack of needed information as to the equipment which was to be put in.

From the time the model machine, as re-designed, was completed and flown on Oct. 29, 1917 several months elapsed before its equipment was finally determined upon. The engineer of the Dayton Wright company testifies that "the information which we were anxious to receive and which was necessary for production was not forthcoming until the middle of April."

There appear to have been several reasons for this. There was always the difficulty created by lack of experience in equipping airplanes for service in war and there was considerable trouble in obtaining some portions of the equipment. But, in addition, it appears that there was a lack of exact and detailed information as to just what was required.

The drawings and the specifications which accompanied the sample plane sent here were supposed to designate defin-

itely the apparatus to be put upon the planes and its location. The testimony is that these drawings and specifications "did not check up with the actual plane," and there was resulting uncertainty as to what should be done.

Communications with the other side were had frequently with regard to instruments, accessories and various parts of equipment, but, despite this, the uncertainty seems to have continued for a long period and there was apparently an inability to frame a definite bill of material which could be given to the manufacturer. The showing indicates either an extraordinary lack of decision on the part of those whose duty it was to decide, or an even more remarkable absence of administrative efficiency in seeking and obtaining necessary information.

About Feb. 10, 1918, definite instructions were received from the other side as to the armament and instruments of the DeH-4, but these instructions involved serious changes in the plane. And, subsequently there were further changes in equipment, as stated below, causing still further delay.

Fourth: Changes in design and equipment of Service Planes

The following statement, set forth in the testimony of Mr. Schoonmaker, the engineer of the Dayton Wright Airplane Co., which is substantially uncontested by the representatives of the Signal Corps, is an illuminating description of the delays in production incident to changes in design made necessary by changes in equipment so far as the DeHaviland 4 is concerned and also indicates the waste thereby occasioned. It will be observed that changes were made necessary not only by new requirements as to equipment, but by inaccuracies in drawings and various defects. Mr. Schoonmaker testifies:

"The first sample DeHaviland machine was received on August 14, 1917. This was accompanied by an incomplete set of drawings, but with the machine as a sample and with what drawings we had at hand, we were able to complete the necessary lay-out from which to build one sample machine which was flown on October 29, 1917. This plane was satisfactory in every detail as a machine and practically no changes have been made in the construction except where they were affected by the equipment which the machine was to carry.

"We were advised at that time in answer to our request for information on guns, that the machine was to be equipped with the Vickers Gun and that the gun mounts would necessarily be the same as the English gun mounts. This information was requested by the Dayton Wright Company during August when the preliminary lay-outs of the machine were being made. At a late date we were advised that the Marlin Gun would supplant the Vickers, and that the Signal Corps would take care of the necessary design of gun mount, etc. The front gun mount design was received on January 8; after a conference with Signal Corps men, it was decided that this mount would not be satisfactory and, therefore, was discarded. The Dayton Wright Company produced a design of gun mount and cartridge box which was built and installed and accepted by the Signal Corps after a firing test on January 26.

"Owing to the fact that the Marlin Gun was not similar to the Vicker, a complete re-arrangement of the cowl over what had already been designed was necessary. The first drawing of the Marlin Gun which we received was delivered to us on February 12 but no bill of material on the complete gun equipment accompanied same. On February 26 we were requested to mount two stationary guns on the forward cowl. This necessitated a re-design of the gun mount already ordered into production, and this work was carried on by the Signal Corps. This also affected all cartridge boxes of which drawings had been made and which were released to production. A re-design of the cartridge boxes for the double gun mount was furnished by the Signal Corps on March 5. This design was not satisfactory as the drawings were incorrect and the pieces manufactured from them did not assemble in the machine. A new re-design was furnished by the Signal Corps on March 15; parts were made from these drawings and were released to production. On April 1 the Dayton Wright Company was ordered by the Signal Corps to again re-design the cartridge boxes changing certain dimensions; since that date few minor changes have been necessary, but nothing which directly interfered with the production of these parts.

"Changing the gun equipment as mentioned above, necessarily changed the shell chute lay-out. The first drawing which we received from the Signal Corps for the left hand gun chute came to us on March 5. Parts made from these drawings were not satisfactory as they did not assemble in the machine. The Signal Corps corrected these drawings and sample parts were made and the Dayton Wright Company's drawings were released for production several days later. The Signal Corps found, however, that these samples were not satisfactory and they were rejected as there had been an error in the drawings. The Dayton Wright Company re-designed the chute for the left hand gun on March 29. Samples were made from these drawings which were satisfactory to the Signal Corps and released to production on April 7.

"The first right hand shell chute was laid out by the Signal Corps on March 6. Samples manufactured from these drawings were not satisfactory and did not assemble properly in the machine. The Signal Corps proceeded on the correction of these drawings and they were released for the production of sample. These drawings were very difficult to work to and samples manufactured from them were not satisfactory and rejected.

"The Dayton Wright Company produced a new design of this shell chute on March 29, which before samples could be made and tried out, it was seen that a new design would be necessary due to the change of location of the electric generator for the electrically heated clothing. A new design was started by the Dayton Wright Company on March 30.

"A design along entirely different lines had been started in the meantime by some Signal Corps men at South Field on March 29, and this type was approved on March 31 by the Signal Corps and drawings were made and released to production. This design was tested out on the evening of April 2 and proved unsatisfactory.

Another new design was started by the Signal Corps on April 3, which after a few modifications was released to production on April 11.

The same procedure of re-design and development as was required for the shell chutes applies also to the cartridge box and shell chute covers.

Our first request for information on the synchronizing device was in November, 1917, but up to February 14 no bill of material or complete set of drawings had been delivered. We received on January 23 a few parts which were intended for production, however, the assembly was incomplete and the parts made would not fit the engine. We received drawings of the hand pump on February 5. During January a sample hand pump was delivered to South Field; no drawing or instructions accompanied this to show mounting and this office was never advised as to its use. When assembled on the machine in January, it was found that an interference was encountered with the gasoline shut-off cocks and strainer, necessitating a re-design of these parts and the transferring of them to the other side of the fuselage. This in turn caused an interference of the spark and throttle controls necessitating scrapping of parts then on hand and re-design of this layout.

The first synchronizing outfit which we received caused a considerable amount of trouble and upon examination of the trigger motors, it was found that practically no two of them were alike and it was almost impossible to get a pair of guns on a machine which would function correctly. The first synchronizers were delivered directly to us instead of the engine builder, and they were not made so as to be directly interchangeable with the motor crank shaft, the result being that a considerable amount of hand work had to be done in the fitting up of these synchronizers.

On April 2 it was found that the synchronizer generator did not have a satisfactory lubrication system and it was necessary to connect it to the motor oiling system. This necessitated the disassembling of the synchronizer head and welding on a special boss for the attachment of this oil line. This has been done on all of the synchronizers to date.

Information, drawings and bill of material for the gun sights were requested on October 19, 1917. A list of different types of sights were received on January 4 but no bill of material or drawings. Drawings for wind vane sights were received February 6. No drawings were ever furnished on any of the sight mounts, however, the sight locations were approved February 13.

This will recall that it was advised that the old English DeHaviland be used for the mounting of guns and sights so that all of the difficulties which were likely to be encountered, could be worked out on this job. Our engine cowling was held within the limit of the cowling used on the English job so that no interference would occur. On November 20, it was called to the attention of the Signal Corps that no use had been made of this machine to date, and early in the Spring was shipped to Wilbur Wright Field.

On April 6 the location of the Aldis sight was removed and changed to the left hand side of the right gun; this necessitating a change of all the parts which had been made up for the old sight and which were already released to production.

Our first instructions regarding the bomb dropping gear were to equip the DeHaviland machine with two rails similar to the English machine. Information had continually been requested on bombing apparatus but no drawings could be furnished. On January 18 we received our first information from the Ordnance Department on Bomb Gear. This was merely an unlocking device and we gave space in our drafting room for several Ordnance Department men to complete their drawings for application to the machine, they being turned over to me on February 1. On going over these drawings, it was found that they were not complete and about a week later more drawings were received which assisted in production of the first model gear. The delivery of this apparatus has been sadly deficient, it being necessary to ship a large number of planes without it, as some of this is built in the floor of the fuselage and must be put in during the various assembly operations. A further change on the operating mechanism of the bombing gear is coming thru which will be incorporated possibly on the five hundredth machine.

Information was requested during October, 1917, on the camera and camera mounts. We were advised at that time that the camera mount which the English DeHaviland was equipped with would also be used on the American-made machine. On January 19 we received from the Signal Corps a camera which would not fit the English mount. As the English mount was already built into a number of fuselages, it was impossible for us to change this part of our early shipments. A new design of mount was made by the Signal Corps and installed in the sample machine in our shop. On February 25 this was rejected by the Signal Corps and a new design started and drawings furnished on same May 27.

The focusing lense retainers were designed at the direction of the Signal Corps for a 4" x 5" lense. The location of these was shifted several times and the size of the lense was changed by the Signal Corps to 5" x 6" and the drawings for retainers were furnished on April 2.

Up to February 14, we had no information on oxygen apparatus except that it was to be part of the equipment. As late as April 6, we had no samples of the apparatus or drawings showing installation of same. Final approval of the oxygen installation was received June 10.

Drawings for the radio equipment and first information regarding same came to us February 1. These were recalled for changes and new set issued which were illegible. These were returned and on February 8 a new set of drawings were received for the bonding together of all metal parts on the machine; these drawings could not be followed on a production basis. The Dayton Wright Company then prepared a sample machine and drawings were made from this and accepted by the Signal Corps March 25. Radio instruments were received February 20 and installation according to Signal Corps drawings was stopped February 25 and new installation directed. The Dayton Wright Company prepared drawings for this installation and wiring according to the sample which was prepared.

On March 28 the generator mount on the side of the fuselage was abandoned. A new installation was furnished by the Signal Corps but was found that it interfered with the landing gear strut. On April 10 the new design from the Signal Corps showing the correct location of the generator was received.

Considerable trouble was encountered with the installation of the Holt flare lamps as there was a misunderstanding between the Dayton Wright Company and Signal Corps as to who was to furnish them. The first Holt flare lights were received on February 25.

The first navigation light samples were received on March 20 and wiring instructions for same were delivered a few days later.

The electric generator for lighting and heating was received on March 15. The Signal Corps drawings showed the location on the side of the fuselage. This was unsatisfactory as the generator propeller interfered with the rear flying wires of the wing structure. The Signal Corps prepared new drawings for the re-locating of this generator but these were unsatisfactory owing to the interference with the landing gear strut. On April 9 a new set of drawings were received showing the correct location of this generator.

Radiator and water lines were approved by the Airplane Engineering Department, Signal Corps on November 21 after flying test. At this time, of course, there was practically no information at hand regarding the equipment of the DeHaviland plane which necessarily added considerable weight, so that the radiators which we had ordered for production were considered unsatisfactory by the Production Engineering Division. The radiators furnished by the Signal Corps were 1" deeper in the core which necessitated re-design of the shutter assembly. At a late date it was decided to make a further change on radiator design, making it 4" longer. This affected the under cowling of the motor, the forward cowling, water lines and numerous other details entailing a large amount of scrapping and re-operation of parts.

The Signal Corps advised that they would furnish us short radiators for our first 150 ships and long radiators for the next 100, after which we were to supply our own. A shortage of 50 radiators was encountered in the first agreement which necessitated us going to the long radiator job 50 machines earlier, which caused a serious delay and complication in the shop.

Drawings were received from the Airplane Engineering Division, Signal Corps, November 21 on gas and air lines. From these drawings all parts were ordered into production. All gas and air line connections were changed by the Signal Corps and final information received on this change April 5. This necessitated scrapping of all parts on hand and a delay was occasioned in securing necessary new material.

The delays at the plant of the Dayton Wright Airplane Company, due to these changes in design, also caused delay in the other plants which were to produce DeHaviland 4s, for both the Fisher Body Corporation and the Standard Aircraft Corporation were awaiting a definite design and a determination of equipment and proper drawings before proceeding to production.

The Dayton Wright Airplane Company was in advance simply because it had the advantage of the possession of the model and it was working out the necessary drawings.

It will be observed that these changes were required in the course of production. That is, instead of proceeding with production on the basis of a given equipment where changes in equipment would cause serious delay, and introducing different equipment in the planes subsequently produced, virtually the entire production was held up to accommodate the new demands.

As Lt.-Col. Horner testifies, "We would go on changing this way and that way and let that change go through production, when it could be done without interfering with production, and if we had done it we would have had a thousand more planes on the French front to-day than we now have without any question."

It is unnecessary to review the changes in the ill-fated Bristol. They were numerous and related to the structure of the plane itself. Production was of course impossible while these changes were in progress. The real effect of the changes, however, in view of the result, was not to retard the production of a useful plane, but to cause an unnecessary expenditure.

Fifth: Conditions in Manufacturing Plants

The conditions in certain plants engaged in the manufacture of airplanes were unfavorable to production, not only because of lack of experience and the absence of mechanics trained in that class of work but because of defective organization and want of efficiency. The Dayton Wright Airplane Company had the difficulties inherent in a new organization, but in view of the changes that were required in the course of production it would be impossible to define to what extent, if any, production was retarded by reason of the fact that the organization was a new one.

The lack of competent organization at the North Elmwood plant (Buffalo) of the Curtiss Aeroplane & Motor Corporation is commented upon later (*post*, pp. 150, 156), but in view of the cancellation of the Bristol order it need not be considered here.

Whatever delay there was, was in the course of an attempt to make an impossible plane. At the plant of the Standard Aircraft Corporation conditions were also far from satisfactory, but for the same reason, so far as service planes are concerned, its capacity for production was not put to a proper test. It should be added that at this plant the first Handley-Page was assembled and successfully flown within ninety days after the company had been given full charge of the matter.

There have not been lacking indications of sinister influences at various plants. The opportunities of workmen at aircraft plants to retard production or to injure material and product are quite obvious and the necessity of keeping the plants free of enemy influences is emphasized in another part of this report. But, so far as the delays in production of

service planes are concerned, it is impossible in view of interrupted work and changing plans to attribute the delays in any definite measure to such a cause.

Sixth: Changes in the Liberty Engine

In any proper estimate of what should have been accomplished in carrying out the aircraft program it is necessary that regard should be had to the development of the Liberty motor. The airplane must have its motor, and it was inevitable that in the development of a new high-power airplane engine, with the object of securing higher power with a lower weight per unit of power, that changes would be found necessary.

Needed improvements were constantly suggested by experimentation, and the number of changes looms very large in the testimony of the experienced engineers who were endeavoring to get into quantity production. It is unnecessary to attempt a review of these numerous changes, for whether time could have been saved by greater expertness is a matter of opinion, and in view of the time that has frequently been spent in the development of new types of motors, there is slight ground for criticism by reason of loss of time in perfecting the Liberty motor.

The difficulties were inherent in the task and the task itself was worth while. As has been said, there was no reason why the development of the Liberty motor should have stood in the way of the production of other motors, such as the Hispano-Suiza, for use in single-seater pursuit planes to which the Liberty engine was not adapted.

But, so far as the heavier observation and bombing planes are concerned, the weight of opinion is that it would have taken about as long to put any other high-power motor into successful quantity production in this country, according to our methods of manufacture, as it has taken to develop the Liberty motor.

The attempt to secure planes and motors through foreign production for service pending this development has already been reviewed. By pursuing different methods it is possible, as testified by Lieut.-Col. Hall, that there might have been a small preliminary production of Liberty motors two or three months earlier; but, making due allowances for the inevitable course of experimentation, the Liberty motor could not have been put into large production much earlier than it was.

What has been called the "immaturity" of the Liberty motor placed a time limitation upon the program for the planes that were made to take this motor, but it may be observed that by May 4, 1918, 778 Liberty motors (U. S. 12s) had been made, of which 390 were taken by the army, and only 36 DeH-4s had at that time been delivered, and no other army planes to take this motor were available.

It can hardly be said that unnecessary delays in service-plane production, caused by bad organization and lack of a settled design, were excused by unforeseen difficulties in the development of the Liberty engine; and it should also be observed that if, in the light of general experience in motor building, delay in the development of the Liberty engine was to be feared, there was the greater reason for making sure, to the full extent of ability, of the immediate production of single-seater pursuit planes for which other engines could be provided.

EIGHTH. CONTRACTOR'S PROFITS

Under the various fixed-price contracts it is probable that large profits have been gained, but definite information as to their extent would not be available without a survey in detail of manufacturing conditions and costs in a considerable number of plants, an undertaking which would have been wholly impracticable in this inquiry. The profits allowed by the cost-plus contracts present a distinct question.

The justification for cost-plus contracts was found in the fact that the undertakings were novel and that the manufacturers did not have accurate data upon which to make a satisfactory estimate of the cost of production. This was conspicuously true in the case of airplanes of types with which manufacturers in this country had been unacquainted previously.

For production in large quantity, either new plants or greatly enlarged facilities at existing plants, as well as special tools, would be required to meet an exigency of uncertain duration, and it would also be necessary to procure the requisite labor and materials for the new undertakings in a rising market and to provide working capital for long periods.

And while motors had been manufactured here upon a large scale, the newly-designed engines for the service airplanes required such a reduced weight per horse power and

such delicacy of construction that it was felt that the enterprise had many elements of uncertainty.

In these circumstances it was not an unreasonable conclusion that if contracts for the new types of airplanes and for the new engine were offered solely on a fixed-price basis, either manufacturers would not undertake the work or would insist upon high prices as a safeguard against the chances of ultimate loss.

It was deemed inexpedient for the Government to undertake the manufacture directly, and it was decided to adopt the alternative of an assumption by the Government of the cost of manufacture through contracts upon a cost-plus basis.

This practice, however, could not properly outlast the reasons which may have justified it at the outset. Contracts of this sort lead to waste, foster abuses, and impose an almost intolerable burden of cost accounting, in itself a hindrance to rapid production. Early in this inquiry it was abundantly shown that it was highly important to establish reasonable fixed prices whenever experience afforded a fair basis for estimates.

The principal features of the cost-plus contracts for airplanes and engines may be said to be these:

- (1) The payment by the Government of the contractor's outlays for labor and materials and for the overhead charges incident to the work;
- (2) The payment by the Government for special tools and certain "increased facilities" located in the contractor's plant, but owned by the Government;
- (3) Reimbursement by the Government for depreciation;
- (4) A fixed profit to the contractor; and
- (5) The fixing of an estimated cost, or "bogey," and a division of whatever saving was effected under this estimate so as to give 25 per cent of this saving to the contractor as additional profit.

It will be observed that by this method the contractor is assured not only the payment of the cost of labor and material used in the process of manufacture, but of administrative outlays for management and supervision, and an allowance for depreciation of plant.

To the extent that these payments are made promptly and at short intervals the working capital required would be reduced. Provision has also been made for the supply of needed assistance by means of advances through the War Credits Board where these are deemed to be justified.

The contractor is guaranteed a certain profit regardless of cost. This is called the "fixed profit." And finally, the fixing of a "bogey" cost was designed to counteract the temptation to wastefulness by giving the contractor a substantial share in the fruits of economy.

And it may here be noted that the popular impression that under this form of contract the contractors receive the same amount of profit, however wasteful they may be, and have no incentive to avoid unnecessary outlays, is without foundation.

The bogey costs were in all cases placed so high that the contractor had every reason to expect that the actual cost would be much less, and that through its share in this saving the contractor would be able to derive an increased profit from economical management.

It is apparent, however, that with a large fixed profit guaranteed the incentive to economy is not as strong as when the entire venture is at the contractor's risk.

And particularly when interruption of work and changes in design vex production managers, and it is difficult to maintain economical methods, there may easily be bred an indifference to an excessive cost where its burden falls upon the Government.

At least this is to be inferred from conditions in certain plants, and the conclusion is unescapable that the cost-plus system of contracts for the manufacture of commodities, as distinguished from such contracts for mere service, is a vicious system, and is to be tolerated only during such period as it is found to be absolutely necessary to secure immediate production.

The fact, however, that a cost-plus system is deemed advisable for a time does not justify an exorbitant fixed profit. It has already been pointed out in the case of the Dayton Wright Airplane Company that the contract for DeHaviland-4s originally called for a fixed profit of \$875 per plane.

This was arrived at on the basis of 12½ per cent of the bogey cost of \$7,000. This, however, was not an actual cost, and, as the event has shown, was very far above the actual cost. If it had been thought fair that there should be a profit of 12½ per cent per unit produced, it would have been a simple matter to have given this percentage of the actual cost, as the actual cost was to be ascertained in the course of the accounting and provide for payments from time to time on account.

There is no conceivable reason for giving a percentage of the bogey cost, if the object were merely to assure the con-

tractor a profit equivalent to a given percentage of cost.

The actual cost of the DeHaviland-4s at the plant of the Dayton Wright Airplane Company, despite all the difficulties of production and the enhanced cost of the first lot of machines produced during a period of many changes in design, is understood to be under \$4,400. A fixed profit of 12½ per cent on the actual cost of each machine would have been about \$550, instead of the \$875 which was fixed by making the calculation on the bogey cost.

Again, in a contract for manufacturing articles at the contractor's plant, the agreed profit upon a cost-plus basis should have a proper relation to the contractor's actual investment and risk.

The contractor is not only reimbursed for his outlays for labor and material, but for expenses of management included in overhead charges, including such reasonable salaries of officers, managers, etc., as may properly be allocated to the Government's work.

There is no sacred formula by which the Government is bound to pay a profit per unit of production regardless of the time in which capital is turned over. The extent to which the Government supplies the needed working capital, either by payments on account of work and materials supplied, or through advances, should also be considered. A percentage of outlays, or of a bogey cost, although small in itself, may give an exorbitant profit as applied to each unit of a large production.

Service Airplane Contracts

In the case of the Dayton Wright Airplane Co. the paid-in capital was \$1,000,000 invested in plant. Advances by the Government to the extent of \$2,500,000 were authorized and in December and January last advances of \$1,000,000 were actually made. These were followed by additional advances, and the balance of total advances on June 30, 1918, was \$1,405,222.57.

Approximately \$750,000 of the money thus borrowed from the Government at interest is represented by investment in fixed assets. The plant is exclusively devoted to Government work, and outlays for labor, materials and overhead, as provided in the contract, are met by the Government.

The operations of this company relating to production may be said to have begun about Aug. 1, 1917. The total fixed profit on 400 Standard-J planes was \$620 per plane, and the fixed profit on the 4000 DeHaviland-4s was \$875 per plane, making a total of \$3,748,000.

With the saving as now estimated of approximately \$2,600 under the original bogey cost of \$7,000 the additional profit of 25 per cent of this saving would amount to \$650 per plane, making the total profits on the DeHaviland contract about \$1,525 per plane.

At the present rate of deliveries the contract for 4000 DeH-4s will be completed before March 1 next. The total profits on the 4000 DeH-4s would have amounted to upward of \$6,100,000, and it is safe to say that including the profit on the Standard-J planes, the company would have earned a profit of more than \$6,350,000 under the original contract.

This does not include whatever profits would have been made on its experimental contract or on the spares for DeH-4s. It should also be added that under its contract it was provided, in substance, that at the completion or cancellation of its contract the Government should pay the difference between the cost of its plant, including real estate, building, machinery and appliances built or otherwise acquired for the performance of the contract, less what was found to be the fair market value at the time when the contract was completed or cancelled, and that in determining (through a board of appraisers) this fair market value, the need or requirement of such a plant in the neighborhood and the probability of securing a tenant promptly, or having an established business available, should be considered as one of the important factors.

In the case of the Fisher Body Corporation, which had the other large order for DeHaviland-4s (4000), as well as an order for 400 Standard-Js, the profits would certainly not have been less. Instead of establishing a new plant, as did the Dayton Wright Co., the Fisher Body Corporation had already effected a highly efficient organization and had an established plant, which required, however, a considerable expansion of plant facilities and special equipment.

The net investment in fixed assets, including building, land and machinery, which was made by the Fisher Body Corporation for the Government work amounted, to May 31, 1918, to \$860,849.05. The corporation was aided by an advance through the War Credits Board of \$2,000,000, made last December. Waiting for the necessary drawings, it got into production later than the Dayton Wright Company and up to Oct. 11, 1918, had only delivered 452 planes. But it should complete

its production of the entire 4000 within the next six months.

As already stated, in accordance with letters obtained at the time the contracts were made with the Dayton Wright Airplane Co. and the Fisher Body Corporation, which promised an equitable readjustment if it was found that the bogey cost was too high, it appears that contracts are now being negotiated for the reduction of the bogey cost of the DeH-4s to \$5,000 and the fixed profit to \$625 per plane. The total profit per plane with the percentage of saving (exclusive of profit on spare parts) under the new contract would amount to about \$775 per plane, or \$3,100,000 in all, which with the profit on spare parts would make the total profit on the DeHavilands not less than \$3,500,000.

Liberty Engine Contracts

The bogey cost, as first fixed in the contracts for Liberty engines, was \$6,087. This was approved by Mr. R. H. White of Cleveland and Mr. Henry May of Buffalo, to whom the propriety of the estimate had been submitted by the Secretary of War. The fixed profit as originally stipulated was 15 per cent of this bogey cost, or \$913.05 per engine. Lieut.-Col. Hall (who had had large experience in engine manufacture) testifies that he made an estimate about the time that contracts were being let, and told Colonel Deeds, that \$2,400 would cover the cost of labor and materials for the Liberty engine, without overhead charges.

In December, 1917, the bogey or estimated cost was reduced to \$5,000 and the fixed profit put at 12½ per cent of this sum, or \$625 per engine, and the contracts with the Packard, Lincoln and Nordyke & Marmon companies were modified accordingly. This was in consideration of further allowances for depreciation and provision for advances by the Government. In last May, the contract with the Ford Motor Co. was modified by the same reduction of the bogey cost and fixed profit. The contracts with the General Motors Co. were put upon the same basis.

Even at this reduced bogey and percentage, the profits allowed were very large.

By Sept. 6, 1918, that is within a year from the date of the contract, the Packard Company had delivered (according to the Government's report) 3100 Liberty-12s, and the agreed fixed profit on these amounted to \$1,937,500.

In the following month it produced 560, and it should complete its deliveries of the 6000 first contracted for not later than January, 1919, and on these 600 engines the agreed fixed profits would be \$3,750,000. This profit it would earn within seventeen months after it received the contract, and if it could have completed the deliveries as contemplated when the contract was made, that is according to contract schedule, the profit would have been earned in eleven months.

Only the fixed profit has been mentioned, as this was definitely guaranteed, but in addition to this the company was entitled to 25 per cent of its saving under the bogey of \$5,000. The Government's estimate is that the actual cost of the first 600 Liberty engines produced at the Packard plant was \$3,873 per engine, and that the average cost of the first 1200 motors was thus \$3,442 per engine.

It would seem that the actual cost of the entire 6000 is likely to be somewhat under \$3,200 per engine. But on the basis of \$3,200 there would be an additional profit, through the contractor's percentage of saving, of \$450 an engine, which would make \$2,700,000 additional profit, or with the fixed profit of \$3,750,000 a total profit of approximately \$6,450,000 earned on the 6000 engines, within a year and five months, despite delays in production.

To this there should still be added a considerable amount for profits on spare parts on the 6000 engines, which may be estimated at upward of \$1,500,000, and thus the aggregate profits on the Liberty engine (exclusive of the original development work) would reach about \$8,000,000.

The Packard Company estimated that on May 31, 1918, from the standpoint of plant values, the total investment exclusively for aircraft motor work was \$11,808,404.47.

This included, however, advances by the Government for working capital amounting to \$2,145,568, and inventory and other items which would be represented in the cost of labor and material ultimately defrayed by the Government.

The proportion of its plant, less depreciation, employed on aircraft work was estimated by the company at \$5,500,000. It should also be noted that in the contract reducing the bogey cost and fixed profit, it was provided that on the termination of the contract the Government should pay for depreciation upon the heat-treating building and equipment erected by the contractor for the purpose of carrying out the contract, the difference between their cost and "the value thereof to the contractor for use in its business," as determined by a board of appraisers; and that in determining this value the appraisers should be guided by the use the con-

tractor "shall have for said building and equipment at the termination of said contract, in the ordinary operation of its business of manufacturing motor cars and trucks, and shall not include the value, if any, which the same may have to the contractor in the manufacture of further aviation motors."

The Government was also to pay the full cost of facilities for testing and inspecting the engines, including the building and equipment erected by the contractor therefor, and should also reimburse the contractor for the machine tools purchased especially for the construction of aviation engines, to be used by the contractor without rental but to remain the property of the Government.

The contract with the Ford Motor Co. was for 5000 Liberty engines. The company did not begin its deliveries until the 14th of June. It was estimated by its officers that deliveries would reach 1500 in October, and that the entire contract would be completed by the first of December.

It is behind its schedule, but between September 6 and October 4 it delivered, according to the Government's records, 768, and it may be expected that it will complete its contract for 5000 by the end of January, 1919.

Under the original contract it would then be entitled to fixed profits on the 5000 engines of \$3,125,000, and the additional percentage of the saving under the bogey cost of \$5,000.

With its well-known efficiency, and in view of the fact that by beginning later it did not have as much difficulty as the Packard Company had experienced, it may be assumed that the actual cost of the 5000 engines at the plant of the Ford Company will be less than \$3,200 per engine and at the rate of \$450 an engine (that is 25 per cent of the difference between \$3,200 and \$5,000) its additional profits would amount to \$2,250,000, or its aggregate profits on the 5000 engines would be \$5,375,000, earned by January, 1919.

The plant investment required for this production certainly cannot be regarded as any greater than that on the part of the Packard Co. The Ford Co. has not received advances from the Government. The Ford Co. also has a contract for 400,000 cylinder forgings for the Liberty engine, on a fixed price basis of \$8.25 each; these are supplied to the other manufacturers.

The contract with the Ford Co. for the Liberty engines provides that there shall be allowed for depreciation on the machinery and buildings especially acquired for the performance of the contract, in addition to the facilities already owned by the contractor, the difference between the fair cost and the fair market value as determined by appraisers at the time of the completion or cancellation of the contract.

The Lincoln Motor Co. has its special feature in that it was a new organization and established a new plant which is devoted exclusively to the manufacture of Liberty engines for the Government. It has a highly expert organization, with Mr. Henry M. Leland at the head. When the bogey or estimated cost was reduced from \$6,087 per engine, with a fixed profit of 15 per cent, to \$5,000 per engine, with a fixed profit of 12½ per cent, the Government made a special agreement with reference to depreciation, which is thus summarized in a resolution of the Aircraft Board:

That the Government make an allowance for depreciation of the company's heat treating plant equal to the difference between the cost thereof and the value to the company of the business at the termination of the contract; further, that the cost of the company's testing plant be allowed as a part of the production cost of the engines to be manufactured; further that the machinery and equipment used by the company in the performance of the contract be depreciated 40 per cent over the term of the contract.

The Government made advances during the last fiscal year to the extent of \$6,500,000; additional advances were made in July and August of \$4,300,000, in order to discharge obligations and maintain a capacity of 1500 engines a month, making a total sum advanced by the Government of \$10,800,000.

The Lincoln Motor Co. had delivered, according to the Government's reports, only 580 motors by the end of June, but it had reached a production of over 600 per month by Oct. 4, and doubtless will soon be at full capacity so that the first 6000 motors will probably be delivered before the end of January.

For the first 600 motors the cost of production at the plant of the Lincoln Motor Co. was \$3,583, which was nearly \$300 per motor less than that of the Packard Motor Car Co., and it may be assumed that its average cost for the entire 6000 will be not much, if any, more than \$3000.

That is the figure which appears in the company's estimate of profit. But on the basis of an actual cost of \$3200 per motor the Lincoln Motor Co. would have earned by January, 1919 (through fixed profits and percentage of saving), on the delivery of the 6000 motors, about \$6,450,000.

There would also be profits on spare parts, which are estimated at upwards of \$1,500,000 more, making an aggregate profit of about \$8,000,000. This would be exclusive of the allowances by way of depreciation.

The investment in real estate, buildings, machinery and equipment (exclusive of the special tools to be paid for by the Government, and the cost of testing and inspection facilities on which there is to be a depreciation allowance of 100 per cent) amounts to approximately \$7,150,000, of which about \$3,460,000 is the cost of machinery, tools and equipment (to July 31, 1918), on which the Government is to pay a depreciation allowance of 40 per cent, in addition to profits.

The entire paid-in capital of the company amounts to \$850,000. At the outset the company obtained on the credit of its officers about \$2,000,000, which served its purposes until it obtained the amounts needed for its plant, equipment and working capital, through advances by the Government.

It is pointed out very clearly that the company has provided an excellent plant for the manufacture of Liberty engines and that ultimately its profit, after paying taxes, will represent only an equity in its plant, without any assured business, as it has been devoted exclusively to Government work.

On the other hand, it may be said that there is a very liberal flat depreciation allowance on machinery, tools and equipment; that the plant is a permanent one, admirably designed for commercial work, and not merely for a temporary exigency, and that there is every prospect that it can be successfully utilized. It should also be said that from the standpoint of the Government it was free to make arrangements with existing plants, and the amount of the profits it should allow should be determined accordingly.

It is unnecessary to review the original contracts with the Nordyke & Marmon Co., which is very far behind in its deliveries, and with the General Motors Co. (Cadillac and Buick plants). The profit allowed per engine was the same as in the other contracts, but the contracts were for fewer engines, 3000 in the case of the Nordyke & Marmon Co. and 2000 in that of the General Motors Co. The Nordyke & Marmon Co. received advances of \$2,000,000. There were no advances to the General Motors Co.

The large percentage of the contractors' profits which will be taken by the Government in taxation is strongly emphasized, and, of course, what the Government takes back through taxation should fairly be taken into account. But the contemplated tax does not justify an extravagant scale of profits which, even after payment of taxes, would permit an excessive return upon the capital invested, in view of the greatly reduced risks of the contractor under the cost-plus contracts.

Revised Contracts for Liberty Engines

What has been said above relates to the original contracts for Liberty engines. During a recent period the contracts with the Lincoln Motor Co., the Packard Motor Car Co. and the Nordyke & Marmon Co. have been revised and put upon a fixed-price basis of \$4000 an engine.

The revised contract with the Lincoln Motor Co. is dated July 31, 1918. The former contract for 600 engines is cancelled and superseded and the new contract provides for 9000 U.S.-12s and necessary spare parts, with an option to the Government to require the production of 8000 additional engines and spare parts. The schedule of deliveries provided for in the new contract is as follows:

Previous to Aug. 1, 1918.....	1,000
August	750
September	1,000
October	1,500
November	1,500
December	1,500
January, 1919	1,500
February	250

The price is \$4,000 an engine. The spare parts are to be delivered on a schedule basis corresponding to a total price of \$4,000 for a completed engine. The contract provides for payments by the Government, by way of amortization upon a basis of 100 per cent, of the actual cost of all testing and inspecting facilities provided by the contractor with the approval of the Government; for payment by the Government, by way of amortization upon a basis of 40 per cent, of the actual cost of the heat-treating building and equipment theretofore provided by the contractor; and payment by the Government, by way of amortization upon a basis of 40 per cent, of the actual cost of all machinery, tools and other items furnished by the contractor.

It is further agreed that in case the Government shall not order from the contractor the 8000 additional engines for which it has an option, or the contractor is prevented by termination of the contract from manufacturing and delivering

the 9000 engines contracted for and the 8000 additional engines, the Government shall pay to the contractor a sum equal to 40 per cent of the difference between the actual cost of its plant, including real estate, buildings, machinery and equipment, built or otherwise acquired by it for the purpose of performing the contract (exclusive of any allowance of interest), and any and all payments previously made by the Government on account of depreciation or amortization.

While the new contract is on a fixed-price basis, provision is made for payments by the Government within ten days of the determination of the various items, on account of the cost of direct materials, supplies and labor, and also for the payment monthly of amounts equal to proper ordinary depreciation, and other proper items of overhead expense not previously paid by the Government.

It is also provided that in case the actual cost of manufacture shall be increased or decreased by reason of any changes in specifications or in the rates of labor, material, supplies or equipment, varying from the rates in force at the date of the revised contract, upon satisfactory proof, the contractor shall be paid the total amount of such increases, in addition to the fixed price, or in case of a decrease the fixed price shall be reduced accordingly.

Up to Oct. 4 the Lincoln Co. had delivered, according to the Government's report, 2566 engines, instead of the 2750 required by the schedule to Oct. 1, and it is likely to be somewhat behind its schedule in the total deliveries, but its deliveries of 9000 should be completed by March next. It may be assumed, as the company assumes in its own estimate, that the 9000 motors can be produced on an average cost of \$3,000 each, which would leave \$1,000 profit per engine, exclusive of the spare parts, making a profit on the engines of \$9,000,000 earned, it may be expected, by April 1; and assuming that the profit on spare parts will be 25 per cent of the profit on the motors, there would be an additional profit of \$2,250,000. On this basis the entire profits earned by the company on the Liberty engine contract would be \$11,250,000.

The new contract with the Nordyke & Marmon Co. was made under date of Aug. 31, 1918. The former contract for 3000 Liberty engines is cancelled and the substituted contract calls for 5000 U.S.-12s and spare parts, with the option of the Government to order 2000 additional. The schedule of deliveries is as follows:

1918					1919							
Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.
50	70	250	300	400	400	475	500	500	500	500	500	500

The contract is on the basis of a fixed-price of \$4,000 per engine, with a provision for increase or decrease in case of a change in the actual cost of manufacture, similar to that contained in the revised contract with the Lincoln Co. The contract also contains a provision for special depreciation, which is somewhat involved and need not be set forth.

The revised contract with the Packard Motor Car Co. was made under date of September 2, 1918. It supersedes the original contract and provides for 12,000 U.S.-12s at a fixed price of \$4,000 per engine, and spare parts on the basis of this price for a completed engine.

It contains provision as to an increase or decrease of price in case of a change of the cost of manufacture similar to that found in the other revised contracts above mentioned. The Packard Co. agrees to deliver the articles at the rate of 600 engines a month, beginning with Sept. 2, 1918.

As the Packard Co. had delivered 3660 engines up to Oct. 4, 1918, the entire 12,000 will be delivered approximately by December, 1919. It is likely that the cost, distributed over the 12,000 engines, will not be more than \$3,000 an engine, and at this rate the profit on the 12,000 engines will amount to \$12,000,000, with probably \$3,000,000 more as the profit on spares, making about \$15,000,000 in all.

Under the original cost-plus contracts for the Liberty engines, that is, with the bogey cost of \$5,000, a fixed profit of 12½ per cent thereon, and an additional profit of 25 per cent of the savings under the bogey cost, the total profits per engine would amount to \$1,075 on the basis of an actual average cost of \$3,200 per engine, or to \$1,125 on the basis of an actual average cost of \$3,000 an engine.

It will thus be seen that the change from the cost-plus contracts to the fixed-price contracts saves the Government from about \$75 to \$125 (or possibly a little more) per engine, on the fixed-profit allowance, and also whatever expense may be saved by the reduced requirements of cost supervision and accounting and in connection with material. Upon the new fixed-price contracts the contractors' profits, though reduced, still remain very liberal.

It is understood that it has been arranged that similar revised contracts on a fixed-price basis will be made with the Ford Motor Co. and the General Motors Co., but these had not yet been executed according to the latest information received.

NINTH. SUPERVISION OF PRODUCTION.—WASTE

Little need be said with respect to the supervision of the production of engines. Although the numerous changes in the Liberty engine, and the remedying of the defects which were disclosed, necessarily involved considerable outlays, the losses due to those causes can hardly be said to be greater than would naturally be expected in the development of a new high-powered motor for airplanes.

It has already been pointed out that the actual cost of the first lot of 600 motors at the plant of the Packard Motor Car Co., which was earliest in production, was as high as \$3,873 per engine, and that this cost was subsequently reduced so that the average cost of the first 1200 motors was \$3,442, and that it is expected that the cost per engine at this plant will fall below \$3,200. Again, the actual cost of the first lot of 600 motors at the plant of the Lincoln Motor Co., was \$3,583, and it is believed that motors can now be produced at this plant at a little, if any, over \$3,000 per engine.

The enhanced cost of the first lots of engines may be said to reflect in large measure the expenditures which could have been avoided had there been no changes in design, but these outlays fell within the range of reasonable experimentation and can not justly be regarded as showing a lack of careful supervision.

The chief losses, which may be properly characterized as waste, have been in connection with the production of airplanes. A statement has already been made (*ante*, p. 15) of the cost of the Standard-J1 training planes which were condemned as dangerous in June, 1918, because of the unsuitability of the type of engine.

The expenditures on the Standard J-1 planes, including the engines, to Sept. 30, 1918, amounted to about \$17,500,000, and the amount which may ultimately be saved if these planes are utilized with another engine can not now be stated.

The changes in the DeHaviland-4s which have been detailed (*ante*, pp. 126-131) caused great additional expense which could have been avoided had there been a more efficient organization and prompt decision as to equipment.

The most serious waste, however, in connection with service planes was in the work and materials thrown away on the Bristol Fighter, which was in course of production at the plant of the Curtiss Aeroplane and Motor Corporation, and was finally condemned in July, 1918.

Under the cost-plus contracts it was of the utmost importance that there should be the most careful supervision of production and an adequate system of cost accounting so that useless expenditures should be avoided and actual costs carefully determined. This undertaking was difficult in itself, but it was rendered even more difficult by the demand for haste and the necessity of quickly providing a large force of inspectors and accountants in a novel undertaking.

Manufacturers were in constant opposition to what they regarded as unnecessarily technical requirements by accountants, and the Government representatives themselves were admonished by their superior officers not to let strictness stand in the way of production. And it could hardly be expected that this large matter of industrial supervision and cost accounting could be adequately handled under the restrictions of military organization. Moreover, not only was efficiency hampered, but the door was open to abuses, and despite the fidelity of many who sought to protect the Government, wasteful conditions were permitted to exist which were wholly inexcusable.

It should be also be said that a large outlay has been caused by the fact that the Army and Navy each maintains a complete staff of accountants so that, for example, in the North Elmwood plant of the Curtiss Company where both Army and Navy work is being done there are two sets of Government employees at work in all branches of cost-plus accounting under the respective contracts.

LABOR

Labor conditions generally were unsatisfactory. In the labor market the Government was largely competing with itself. At the plant of the Packard Company the labor turnover is from 400 to 600 per cent a year, which would mean 40,000 to 60,000 men coming and going in order to maintain an organization of 10,000 to 11,000 men.

The larger portion of this 'floating' as it is called occurs among probably 4000 to 5000 men, and the testimony is that in some departments there has been a complete change about fifteen times a year. Women have largely been employed in many plants with satisfactory results.

The plant of the Wright Martin Aircraft Corporation at New Brunswick, New Jersey, is a conspicuous exception, few, if any, women being employed in the shops. The testimony

is that the local labor organization has taken a stand against the employment of women, and accordingly this has not been pushed by the management.

In the case of the Wright Martin Co., also it was apparent that a very large proportion of the employees were within the draft age as fixed by the Selective Service Law of May 18, 1917. The records show that on Aug. 15, 1918, 41.36 per cent, or 2,300 of the total number of employees (5560) at the New Brunswick plant were within the draft age, and of this number 15.83 per cent were in Class 1.

The report by the representatives of the Government at this plant states that the method used by the company for securing deferred classification and indefinite furloughs is as follows: When a man is employed who is in Class 1 of the draft, he is given a week to "make good." If he then is found to be efficient his foreman induces an application for deferred classification, and if this is refused by the District Board and the employee is called to camp, a request is made by the company to the personnel department of the Bureau of Aircraft Production for his return on indefinite furlough. Prior to August, 1918, the operations of the draft department of the company were open to serious criticisms and exhibited many irregularities.

In one case a man, whose duties were such that anyone who could handle a screw driver could do his work, was drafted and immediate steps were taken to have him returned as a "motor builder." Previous to his employment by the company he had been employed as a stock clerk by a manufacturer of gowns and he had no previous mechanical experience. In another case a man who was considered a deserter by his Local Board was finally located at the plant of the Wright Martin Co., where he was arrested and inducted into the Army.

Affidavits were immediately presented for his return from camp upon industrial grounds, and he was returned accordingly. One who had been a clerk of a carpet company, without mechanical experience, and who had a minor assembly job, was drafted and was returned on indefinite furlough as a necessary employee.

A former proof-reader, a former skating-instructor, and a former coupon-clerk, who had obtained employment at the Wright Martin plant were drafted and similarly returned. In other cases, men whose work was entirely clerical secured deferred classification on industrial grounds. Cases of this sort have now been brought to the attention of the Provost Marshal General.

It is stated by the Government representative that at present the draft department of the Wright Martin Co. is in competent hands, and it appears that its work is being done with a better regard for the interests of the Government.

Labor cost.

To establish the labor cost under cost-plus contracts it was necessary that there should be proper time records and suitable provision for the identification and check of employees as they entered and left the factory.

The opportunities for irregular pay-rolls, through laxity or connivance, are obvious. The conditions in this respect at the North Elmwood (Buffalo) plant of the Curtiss Aeroplane & Motor Corporation were especially bad. It was at this plant, (completed last fall) that the cost-plus work was done on the Bristol Fighter for the Army and the HS-1 seaplane for the Navy.*

There is abundant testimony, with picturesque detail which can not be given here, to the effect that at the North Elmwood plant large numbers of employees were kept on the pay-rolls when they were not needed; through an utter lack of a decent system men and women were paid when they did not work; employees were able to leave factory without being detected and remain absent for hours while recorded as on duty; employees would ring one another's time cards; men who were without work enough to keep them busy during the day were employed over-time at increased rates; men were brought to the plant on Sundays when there was virtually nothing to do; and for many months there was such demoralization at this plant that it became the subject of contemptuous gossip among the employees and in the community.

One of the inspectors for the Navy testifies that as late as July he, with others, went through the plant at night on a tour of inspection, and not only were they able to go

from one end of the plant to another without being asked for their passes, but they found absurd conditions of idleness. In one room, "the foreman and three men (were) sprawled out on the floor," and, as he put it, there were "slackers from one end of the plant to another."

It is urged in palliation that the cancellation of the Spad order and the difficulties encountered in the development of the Bristol created a state of confusion, and that the management was constantly expecting to be able to get into production and felt it necessary to maintain an adequate force for this purpose. That the force was increased heavily at the North Elmwood plant during the early period, despite the fact that there were serious difficulties with the Bristol design and the company was not ready for large production, is beyond question.

In October, 1917, the average number of men working at the North Elmwood plant was 578. In December this was increased to 4142; in January, to 5970; in February, to 7029; there was a decrease of a few hundred in March and April, and an increase in May to 7557, and in June the average number at work was 9788.

To approximately sixty per cent of its capacity, this plant was either idle or working only in connection with the Bristol. The employment of men on a large scale when there was not work enough for them had much to do with the virtual destruction of the morale at the plant.

But whatever loss the Government has sustained in this way is not nearly as it might otherwise have been, by reason of the fact that a careful re-audit is in progress, which should be strictly prosecuted, and final settlement of payments awaits a satisfactory determination of actual outlays.

Employment of Alien Enemies

Among the regulations established by proclamation of the President on April 6, 1917, was the following:

An alien enemy shall not approach or be found within one-half of a mile of any Federal or State fort, camp, arsenal, aircraft station, Government or naval vessel, navy yard, factory, or workshop for the manufacture of munitions of war or of any products for the use of the army or navy.

Under the authority granted by the President to the Attorney General for the administration of the alien enemy regulations, the Department of Justice developed a permit system whereby alien enemies could obtain permits to be employed within a munitions factory, including one engaged in the manufacture of aircraft, within the half-mile zone.

The granting of such permits is entrusted to the United States Marshal of the district, who is authorized to issue them if he is satisfied that such action will be in no respect dangerous to the community or the United States. He is required before issuing a permit to confer with the special agent of the Department of Justice in the locality, to make a thorough investigation, to get the approval of the United States attorney or assistant United States attorney of the district, and also to obtain from the employer a certificate in writing to the effect that he desires to employ the applicant and that he is satisfied that such employment will not be to the injury of the community or the United States. Sponsors or bonds may be required and all such permits are revocable.

It will be observed that while the precaution has been taken to require suitable investigation by agents of the Government, the co-operation of the employer, who has special opportunities for obtaining accurate information, is expected. It is manifest that unless the Government is in possession of facts showing the inadvisability of the employment, the certificate of the employer in compliance with the regulations is likely to be most persuasive.

There is considerable difference in the practice of the various companies engaged in the manufacture of aircraft as to the employment of enemy aliens under these regulations. The following illustrations will suffice:

The Fisher Body Corp. states: "We do not employ any German aliens in our aeroplane factory or in our aeroplane divisions." On May 22, 1918, Mr. Kepperley, the Vice-President and General Manager of the Curtiss Company, gave instructions that under no circumstances should alien enemies be employed. Despite this instruction some alien enemies, who had previously been employed on permits, were retained in positions of importance. One of these, who began work for the Curtiss Company last fall, was put in charge of the milling machine department in the machine shop, and became assistant general foreman of the machine shop at the North Elmwood plant.

Another German subject (having a brother in the German navy) who began to work in the Curtiss plant in February 1917, became foreman in the welding department at the

*The Curtiss Aeroplane & Motor Corp. has seven distinct plants: at Buffalo, the Churchill Street group (including the Churchill Street plant where training planes are made, and the plants at Niagara Street, Bradley Street and South Elmwood, making parts for Churchill Street); the Austin Street plant, doing Navy work, including contracts for the British Government; and the North Elmwood Avenue plant. At Hammondsport, New York, motors are manufactured exclusively. The work, except at the North Elmwood plant, is on a flat price basis.

North Elmwood plant and has been at work on all the tubing work and tail units for the Bristol Fighter as well as on the engine braces for the HS flying boats. Another, who had himself served one year in the German army and was discharged on account of wounds, was employed as tool maker at the Curtiss plant until sometime in June.

The Lincoln Motor Company states: "It is our endeavor to employ none but American citizens or friendly aliens. We are careful and using every precaution to not employ enemy aliens." The Nordyke & Marmon Company is equally careful. Their statement is: "At this date there are no alien enemies employed in the airplane engine division. A very few have been employed in this division from time to time but for only short periods at a time, as it has been our settled policy from the beginning of the war to keep alien enemy employees out of our Government departments, notwithstanding the individual man might be perfectly harmless. As fast as these men have been discovered they have been discharged."

About 200 enemy aliens (including Austrians and Hungarians) are employed by the Packard Motor Car Company. About 200 enemy aliens (not Germans, but Austrians and Hungarians) are employed at the plants of the Wright Martin Aircraft Corporation in New Brunswick and Newark. No enemy aliens are employed by that company at its Long Island City plant.

The Ford Motor Company has about 250 German aliens who are employed in departments dealing with Government work. 143 of these are in departments in which from 20 to 60 per cent of the work done is Government work; 35 are at the blast furnace, and 61 are at the ship-building plant which is doing Government work exclusively. These enemy aliens are working under special permit granted on the company's recommendation.

German Sympathizers

The serious risk that is taken in permitting men of known pro-German sympathies, whatever their citizenship, to work in aircraft plants in any important capacity is generally recognized. The opportunities are abundant for delays and interferences in production through the action or inaction of those controlling the progress of production.

It is the assumed sympathy with his nation which makes the employment of the German subject dangerous, and the danger may be quite as great in the case of one who, although not an enemy alien, is more friendly to Germany than to the United States.

There have been persistent rumors of pro-German sympathies on the part of employees of the Curtiss Company, but it has been impossible to ascertain to what extent, if any, the demoralization that until recently has existed at the North Elmwood plant of that company was due to any influence of this hostile description.

The conditions that existed naturally bred distrust which was reflected in common talk, but facts warranting a definite conclusion as to disloyalty on the part of employees in important positions are lacking.

In the case of the Ford Motor Company, one of the company's employees (who formerly had been in the Educational Department and had represented the American Protective League) testified as to his inquiry into cases of disloyalty. The reports obtained by him exhibit utterances of employees in antagonism to the Government, insulting references to the President, and praise of the Kaiser.

In an extreme case, in which the employee reviled and even threatened the President, there was a prosecution and a plea of guilty. The man was fined \$300, was released, and the testimony is that he resumed work in the Ford plant. The reports were numerous, and the employee who obtained them testified that there were about 200 employees whose loyalty was seriously open to question, but how many of these were employed in Government work he could not say.

So far as the Liberty engine was concerned, his investigation related to half a dozen cases in the Drafting Department in the Ford Company. In this department there was a serious situation which engaged the attention of the management. Its importance was manifest from the fact that the drafting department embraces the tool design and drafting room in which the drafting work upon the Liberty engine is done, and it is possible for one in that department to bring about delays, the causes of which, in view of the multiplicity of drawings involved, it would be difficult satisfactorily to trace.

This department was in charge of Carl Emde. There were repeated reports of pronounced pro-German utterances by Emde. A former employee, who had left the plant voluntarily and had later been found with plans and photographs of the plant, was a close friend of Emde's and had been employed in his department. This man, it is understood, has been

interned. While nothing conclusive could be established against Emde in relation to his work, the advisability of removing him from a position of such strategic importance was clear to some of the most important men in the management.

A conference was held on the subject at which Mr. Ford and the factory managers were present. According to the minutes of this conference reports were read "from various members of the drafting department who were in touch with the situation, and who felt that the department was practically a pro-German institution." Several conferees expressed the opinion that Emde should be removed, and one said that in his opinion "in the very nature of things Mr. Emde could not give us everything required to assist the Government of the United States." Mr. Ford, however, was opposed to that course and overruled his associates. Mr. Ford's position and his reasons are thus set forth in the minutes:

Mr. Ford deliberated and stated that he had heard numerous rumors, but in speaking of all he had heard there had not been one thing shown him which would make him change the present head of the drafting department. He felt that it was a time of sacrifice—that in the next few years every man would be called upon to make some sort of sacrifice, and that possibly Mr. Emde, German born, was making his sacrifice now when making drawings for the Liberty motor to be used ultimately against Germany.

This statement of attitude is sufficiently expressive and requires no comment. The proposed removal did not take place. There has been a laxity at the Ford plant with respect to those of German sympathies which is not at all compatible with the interests of the Government. In deference to Mr. Ford's view, those in direct charge of production, who were alive to the situation, have had to pursue a policy of constant watchfulness and supervision instead of being free to take the precautions which the exigency demanded.

MATERIALS

The leading causes of waste in material were engineering changes and faulty workmanship. As material was rendered useless it was scrapped, and there is no little evidence of a lack of care in securing salvage.

For the losses due exclusively to changes in design after authorized production had begun the manufacturers cannot be regarded as responsible; and these losses, while they cannot be accurately computed, are undoubtedly heavy.

Their extent, of course, is proportioned to the stage of production reached when changes were directed; and with respect to the service planes the history of production at the Dayton Wright Airplane Co., the Fisher Body Corp. and the Standard Aircraft Corp. discloses the same conditions varying only in degree as to the delay and waste caused by repeated changes.

With respect to the intelligence and efficiency of the inspection, and the extent to which rejections have been on sound grounds, there are naturally differences of opinion and complaints and counter-complaints the basis for which cannot be satisfactorily determined. It is to be noted that the rejection of spruce which has gone into production has reached a high percentage. Even at one of the best plants the Government representative puts the percentage as high as sixty per cent after allowing for salvage, and at other plants the percentage of rejections was probably higher.

A poor industrial organization such as existed at the plants of the Standard Aircraft Corp. and the Curtiss Company (North Elmwood plant) did not favor economical production, and in the case of the former company conditions were aggravated, as already pointed out, by the assignment to that company of a large number of small orders for varied work.

At the North Elmwood plant of the Curtiss Company the waste which was incident to delay and changes was vastly increased by irregular practices. Thus, in order to keep men busy who apparently had no proper work to do, there was excessive production of parts.

A production order might be for 500 parts but the actual production might run to 5000 or even more of these parts until this unwarranted conduct was discovered and stopped. There is instance after instance of excessive production which served to increase the size of the scrap heap when a change made the parts useless.

Again, at this plant when a change would lead to an order stopping the production of parts, production often would continue despite the order.

As an illustration, one witness testified that he had personally given a stop order on certain metal parts and found two weeks after, in going through the metal shop, that they were still making the parts, sending them through the various operations and working over-time on their production.

During periods of idleness employees devoted their time to making clocks and toys out of the materials at their com-

mand in the factory. Excess material was scattered about the factory without a proper record being kept of it. And it appears that material would be sent to the scrap heap instead of being properly salvaged, in order to cover mistakes.

There was also a lack, at the Curtiss plant, of proper records of material. In the case of steel stores there was confusion between what had been supplied for the Army work, for the Navy work, and for the Curtiss fixed-price work so that accurate accounting based on the ledger entries was wholly impossible.

And in addition to other manifest delinquencies, there was an absence of proper plant protection. The situation of the company in view of its experience with both the Spad and Bristol orders was undoubtedly a difficult one, but the lack of competent industrial administration is too clear to admit of dispute and has freely been confessed.

There has been little evidence at the North Elmwood plant of the exercise of the broad powers of the Government to prevent these abuses, and the fact that conditions were permitted to continue reveals the failure of the representatives of the Signal Corps to take proper steps for the protection of the Government's interest.

There was, however, such an absence of system on the part of the company in the keeping track of parts, and so many changes in the persons employed, that, while there is abundance of general testimony, it is practically impossible at this time to trace particular instances of dereliction to individuals in order with suitable particularity to support definite charges.

The divided responsibility which resulted in giving the design of the Bristol so largely into the control of the representatives of the Curtiss Company was also a source of embarrassment, and the extreme haste to make up for lost time added to the confusion. Conditions through the winter and early spring were chaotic and the improvement that has been made since that time has been unnecessarily slow. It is fair to say, however, that recently there have been changes which promise a needed betterment in the industrial organization.

So far as the loss of the Government in connection with the Bristol is concerned the payments already made to the Curtiss Company, according to the Government accounts, amount to upwards of \$2,000,000 exclusive of advances, and as already stated, the Government has estimated that the loss, including claims growing out of the cancellation may reach \$6,500,000 (*ante*, p. 16.)

The Government, however, has a margin of security by reason of deferred payments and a re-audit is in progress which must be completed before a final settlement is made for materials furnished. The loose methods employed by the company should be taken into consideration and a final settlement should be reached only upon satisfactory proof of proper outlays.

Overhead Charges

In the course of production payments have been made on account of overhead charges upon the basis of a general estimate; that is, by taking a percentage of other outlays, which seems to be justified in the experience of the plant, as representing the overhead expense. The overhead expense embraces general administrative outlays, including executive salaries; and the theory of the cost-plus contract is that the Government pays the expense of superintendence as a part of the cost.

It is, of course, important that fair salaries should be allowed, and all exorbitant demands rejected. Reference has already been made to the salaries paid to the executive officers of the Dayton Wright Airplane Co., who were at the same time the stockholders in a close corporation and divided their time with other companies from which they received high salaries.

There appears to be no justification for even the temporary allowances to the Talbotts and Kettering of annual salaries aggregating \$100,000, and the explanation furnished that the "relations with the contractor were somewhat delicate at first, and, moreover the company was in crying need of cash, and any withholding of amounts due was sure to create much friction," is not convincing; inasmuch as the individuals, and not the company, got the money, and it is difficult to see how "friction" in this matter could have injured the Government.

It is also stated that when the salaries were allowed in the fall of 1917, dating from Aug. 1, 1917, it was felt that it was a matter of considerable importance "that would have to be passed by Colonel Deeds who was in charge of the Equipment Division," but Colonel Deeds testifies that he knew nothing of the salaries that were paid to these officers.

It should be said, however, that these allowances, under

the terms of the contract, should be regarded as tentative, and that it is within the authority of the finance department in its final settlement to adjust the matter on a fair basis. And that is the position of that department.

Even more extraordinary was the salary paid by the Standard Company to its president, Mr. Mingle, at the rate of \$63,000 a year, which is sought to be charged as a part of the cost of operations. This, however, has not been allowed.

The question what would be a proper allowance has been under consideration. Several vouchers have been passed which represent merely payments on account, or payments "subject to adjustment," and it is stated that the amount of Mr. Mingle's salary thus far actually allowed is at the rate of \$15,000 a year.

The adjustments of overhead expense as are the other payments on vouchers under the cost-plus contracts, are subject to a revision of accounts and it is within the power of the finance division in the ultimate adjustment of cost in accordance with the terms of the contract to protect the Government against any claims on the part of the contractors which may be found to be unjustified.

TENTH. SPECIAL MATTERS

1. Purchase of the Plant of the General Vehicle Company

In November, 1917, the Government purchased the plant of the General Vehicle Company at Long Island City, New York, for \$1,527,568. The purchase embraced all the real estate, building and machinery constituting the plant, and all other assets, except that patents (other than those relating to internal combustion rotary aircraft engines) franchises, good will, cash, bills and accounts receivable, specified securities and all inventory assets not acquired and used in connection with the manufacture of Gnome engines, were retained by the General Vehicle Company.

The company also agreed to release for the use of the Government its administrative and manufacturing organization so that the Government might take over the plant property and organization as an active manufacturing establishment in full readiness for production.

Upon a physical valuation and inspection of the books of the company by Government appraisers and accountants showing that the price was a fair one on the basis of prices previous to the war, and upon an opinion of the Judge-Advocate General as to the legality of the purchase and as to the propriety of the form of contract, the purchase was recommended by the Aircraft Board.

The advisability of the purchase, however, was doubted at the time by officers of the Government. It appears that at the outset, in formulating the aircraft program, it was supposed that the Gnome rotary engine would be a factor of some importance, and a small order for Monosoupape motors was placed with the General Vehicle Company, but in view of doubts as to the planes to be built, with which such engines would be used, further orders were not placed.

Later, on word from overseas that Gnome rotary engines should be put into production, there were negotiations with the General Motors Corporation looking to the acquisition of the General Vehicle plant and the manufacture of these engines in large quantities. Before the matter was closed, the instructions from abroad were changed and the proposed transaction was abandoned.

The considerations underlying the purchase are stated in the recitals of the Aircraft Board in the resolution adopted at its meeting of Oct. 19, 1917. It was stated that advices from France indicated a doubt as to the future demand for rotary engines in aviation, but that nevertheless these engines would be used to a greater or less extent for a considerable period to come; that it was desirable that "the technique of manufacture of rotary engines should in any event be studied and developed in the United States in case of need;" that the General Vehicle Company had "the only plant and organization of substantial size in the United States, equipped and organized with the necessary facilities and experience for the manufacture of such engines;" and that the present and future demand for rotary engines was "not sufficient in amount or sufficiently continuous to justify a manufacturer in the maintenance of a plant and organization adequate for a prompt supply of such engines and for the proper study and development of the technique of that type of engine."

In a previous part of this report (*ante*, p. 98), reference has been made to the opinion of the Joint Army and Navy Technical Board, given on Nov. 16, 1917, that in the program for the coming year rotary engines should be considered of secondary importance, but that it was deemed desirable that the art of building rotary engines should be retained in the United States and that for this purpose the organization skilled in rotary engine production should be preserved.

While it was thought that an order which had been given to the Union Switch and Signal Company for 2500 80 hp. LeRhones was larger than was necessary to preserve the art, it was further recommended that steps be taken to maintain the possibilities of production of the 160 hp. Gnome engine. The resolution of the Joint Army and Navy Technical Board did not in terms approve the purchase of the General Vehicle Company's plant, nor did it express opposition in any definite way.

The actual necessity of the purchase of the General Vehicle Company's plant is not apparent. As soon as the Government made the purchase, a corporation called the Aeronautical Engine Company, with a nominal capital, was incorporated for the purpose of building Gnome engines at the plant and contracts were made for the manufacture of small quantities at cost, without profit. This, however, did not continue long.

It was found that the Union Switch and Signal Company had mastered the art of making LeRhone engines, and although these were of a different type, it seemed that the necessity of keeping the organization in existence at the plant purchased from the General Vehicle Company soon ceased, or was very much minimized. In April last, it was proposed that the plant at Long Island City be leased to the Wright-Martin Company for the manufacture of the 300 hp. Hispano-Suiza engines, and an arrangement for this purpose was made soon thereafter, one of the reasons being stated to be "the practical abandonment of the manufacture of Gnome motors."

At the time of the purchase of this plant by the Government, the General Vehicle Company had outstanding notes amounting to \$1,530,000, which were held by the Peerless Truck and Motor Corporation. The purchase price paid by the Government was substantially equivalent to the amount of these notes and thus provided for their retirement.

The purchase, however, was made on the basis of the value of assets, and whatever difference of opinion there may be as to the advisability of the purchase, there are no facts warranting the conclusion that it was not made in good faith or that the amount paid was in excess of the fair value of the property acquired.

2. Mahogany Manufacturers and Importers Association

True mahogany is a desirable wood (ranking in the opinion of the Government's production engineers next to Black Walnut) for the making of propellers for service or combat airplanes. To meet this demand, contracts had been made for Mahogany in the fall of 1917, but with only one responsible corporation, that is, Lewis Thompson and Company. A contract with one of the companies selected was cancelled because it was apparently without financial resources and could not provide a bond, and in the case of another contractor no deliveries were made.

In the beginning of January, 1918, it appeared that there was a serious shortage in the Government's supply of wood for service-plane propellers and through the War Trade Board the leading Mahogany manufacturers of the United States were invited to a conference in Washington.

This conference was held on Jan. 21, and at that time, or in the later conferences, the following corporations and firms were represented: Huddleston-Marsh Mahogany Company, Ichabod T. Williams & Sons, George D. Emery Company (said to be closely affiliated with I. T. Williams & Sons) and the Astoria Veneer Mills and Dock Company of New York; Palmer, Parker and Company, of Boston; Lewis Thompson and Company, and S. B. Vrooman Company, of Philadelphia; Freiberg Lumber Company, of Cincinnati; C. C. Mengel and Brother Company, of Louisville; Talge Mahogany Company, of Indianapolis; C. L. Willey Company, of Chicago, and the Otis Manufacturing Company, of New Orleans.

At the first conference the manufacturers were notified of the Government requirements for propeller stock, their co-operation was sought, and they were asked to advise the Government of the quantity which each could furnish, and the price. The representatives of the War Trade Board suggested the advisability of an organization of the manufacturers to secure effective co-operation with the Government, and accordingly an association of the manufacturers was at once formed which appointed a War Committee composed of A. S. Williams, of the Astoria Veneer Mills and Dock Company, C. H. Thompson, of Lewis Thompson and Company, F. C. Leary, of Ichabod T. Williams and Sons, F. G. Otis, of the Otis Manufacturing Company, and J. C. Wickliffe, of the C. C. Mengel and Brother Company.

The committee met at once and passed a resolution expressing the opinion that the best interests of the Government would be served by the purchase by the Government "of all Central American mahogany logs now under contract with the members of the association at a price to be agreed upon; the

Government to arrange transportation of said logs; the manufacturing of the logs into lumber to be done by the mills represented by this association at a price to be agreed upon."

At the same meeting, the officers of the association were elected: Thomas Williams, of Ichabod T. Williams & Sons, president; R. S. Huddleston, of the Huddleston-Marsh Mahogany Company, treasurer, and Charles H. Thompson, of Lewis Thompson and Company, secretary.

This proposition was rejected by the representatives of the Signal Corps, for reasons stated at length, which were in substance that it was deemed inadvisable that the Government should arrange for the purchase of logs directly from the loggers in Central America and Mexico in view of the unfamiliarity of the Signal Corps with the logging business, or that the Government should take over existing contracts for purchases of logs on account of the complications that might arise, or that the Government should become directly involved in log purchases.

Recognizing the difficulties in the disposal of a largely increased quantity of lumber, the representatives of the Signal Corps felt disposed to pay "a higher price than pre-war or existing prices for propeller stock" in order that the mahogany manufacturers might offset any loss due to the low market value of rejected material.

It was then recommended by the Signal Corps that the manufacturers should make a proposition as to the price to be paid for propeller stock, and it was stated for the manufacturers that they could not quote prices on the basis of the existing Signal Corps specifications, as these were too restrictive as to the grade to be selected and permitted the Signal Corps to accept or reject the material based upon the judgment of the inspector.

It was finally suggested that the manufacturers should submit a proposition based on what are called 'National Hardwood Inspection' rules (that is, the rules of the National Hardwood Lumber Association) quoting a separate price on "first and seconds, selects and No. 1 common."

Discussions continued between the War Committee of the Association and representatives of the Government, among the latter being Lieutenant Ryerson who was in charge of propeller parts in the Plane Production Section, Joseph S. Otis (who, as the result of a disagreement, had recently severed his connection with the Otis Manufacturing Company and had offered his services to the Government as a mahogany expert, and representatives of the Lumber Committee of the Council of National Defense.

At the meeting on January 23rd, according to Lieutenant Ryerson's report, the War Committee of the Association suggested prices for propeller mahogany according to 'National Hardwood Inspection' rules as follows: firsts and seconds, \$350 per M feet; selects, \$320; No. 1 common, \$270.

After these figures were submitted a discussion of costs followed in which Joseph S. Otis, representing the Government, and J. C. Wickliffe, representing C. C. Mengel and Brother Company, gave their respective estimates of costs. Mr. Otis' estimate was considerably lower than the other, and was contested by Mr. Wickliffe.

The question of specifications was again discussed and the Signal Corp representatives stated that it would be impossible to place orders on the basis of 'National Hardwood Inspection' rules, which permitted widths considerably less than those required for propeller stock.

After further parley, Lieutenant Ryerson stated that it would be preferable to negotiate with the various manufacturers and importers individually for the purchase of such mahogany as they were in a position to offer. It was considered that if negotiations could not be brought to a close on the basis of the prices quoted that it might be desirable for the Government to fix a price for the purchase of propeller stock and agree to provide in its contracts that after partial performance there should be an audit of costs and a readjustment of prices upon a fair basis.

After the negotiations had thus proceeded for several days, the manufacturers submitted to the officials of the Signal Corps the opinion that Joseph S. Otis was not competent to advise the Signal Corps with respect to mahogany costs and suggested that action should be taken by which some one should be put in charge of the purchases of mahogany for the Government "who could develop the actual facts and be fair to the industry." Joseph S. Otis left the Signal Corps on January 29th.

On January 31st Henry Lockhart, Jr., was placed in charge of the 'Materials Department, Foreign and United States' which had the duty of procuring the materials necessary for the production of airplanes, with the exception of motors and instruments.

About February 5th, Henry K. S. Williams, who had formerly been in the lumber business as a member of the

firm of Ichabod T. Williams & Sons (being a brother of Thomas Williams of that firm) but had retired several years before, was put at the head of the Hardwoods Section, which was a sub-division of the Materials Department and had charge of the orders for woods required for propeller stock.

Shortly after, on February 25th, J. C. Wickliffe, who had been for ten years Secretary of the C. C. Mengel and Brother Company of Louisville, and had been active as a member of the War Committee of the Mahogany Manufacturers and Importers Association, entered the service of the Government as assistant to H. K. S. Williams in the Hardwoods Section.

The suggestion that he should take this position was made about the middle of February in a conversation between H. K. S. Williams and Mr. Mengel when the latter was asked if he could spare Mr. Wickliffe from his organization.

On March 4, 1918, J. Edward McCullough, who had been superintendent at the mill of the George D. Emery Company, one of the members of the Mahogany Manufacturers and Importers Association, was made district inspector of mahogany as well as other woods in the New York district, embracing Boston, New York, Philadelphia and New Orleans.

He was selected by S. B. Vrooman, Jr., who about February 10th was given general charge of the inspection of all propeller lumber throughout the country. Prior to his connection with the Government (he started as an inspector in December, 1917) S. B. Vrooman, Jr., had been in the service of the S. B. Vrooman Company, also one of the members of the Mahogany Manufacturers and Importers Association; he was, and has continued to be, during his service with the Government, one of the stockholders of that corporation (*ante*, p. 68).

Mr. Wickliffe, during his connection with the C. C. Mengel & Brother Company, had owned five shares of its preferred stock, which he disposed of some years ago; his wife owned five shares of the common stock, which were sold when he entered the Government service.

His salary as secretary of the Mengel Company had been \$500 a month; his compensation from the Government was at the rate of \$4000 a year. When it was suggested that he should become connected with the Government, he said that he could not afford it, but he was informed that Mr. Mengel had offered to continue his salary "as a donation to the Government during the war."

Mr. Wickliffe replied that he did not like the arrangement, would not accept it without Mr. Lockhart's approval, and in any event would not consent to be paid more than enough to defray the living expenses of himself and his family. Mr. Wickliffe was paid by the Mengel Company, in addition to his salary from the Government, \$250 on March 25th, \$250 on March 29th, and \$250 on April 15th, a total of \$750.

This was subsequently adjusted on the basis of \$350 for the period to April 1st and \$400 was returned by Mr. Wickliffe to the Mengel Company. This was explained in Mr. Wickliffe's letter to Mr. Mengel as follows:

628 Lexington Place, Washington,
Apl. 13th, 1918.

Mr. C. R. Mengel,
Prest., C. C. Mengel & Bro. Co.,
Louisville, Ky.

Dear Mr. Mengel:

The Signal Corps having fixed the salary I am to receive from them at the highest figure they can pay of \$4,000.00 per annum, I want to let you know that I think it necessary now that you reduce the amount that you are remitting me monthly to \$350.00 per month. As near as I can estimate it, I can get by on Washington living expenses and do such official entertaining as I shall have to do on the sum of these two amounts. If I find that I cannot, I shall frankly let you know the condition. But I feel that living here and doing the necessary at my present job on this figure is about the equivalent of the salary I had when I was with you in Louisville. Therefore, kindly give the necessary instructions to have the remittance cut down.

Again thanking you and the company through you, I am,

Very truly yours,
J. C. Wickliffe.

The arrangement with C. C. Mengel and Brother Company was approved by H. K. S. Williams in his letter of April 24, 1918, as follows:

Washington, D. C., April 24, 1918.

From: Office of the Chief Signal Officer.
To: C. C. Mengel & Brother Co., Louisville, Ky.
Subject: Services.

I. In line with the request of your president, Mr. C. R. Mengel, this Section desires to give you this letter stating that at the time it asked you for the services of your former secretary, Mr. J. C. Wickliffe, it was fully understood by it that you or the Mahogany Industry would pay him an amount of money per month over and above the salary the Signal Corps was authorized to pay him, so that the sum of these two would be sufficient to cover his and his family's expenses during his service with the Signal Corps. This was done with the full knowledge of Mr. Henry Lockhart, Jr., head of the Materials Department, because of the fact that the Hardwood Section needed his services, and in view of the further

fact that your offer to do this was made with the distinct understanding that he should sever all connection with your company and with the mahogany industry and assume his new duties, of course, entirely as a member of the Signal Corps organization. This Section would also set forth the fact that your offer was specifically asked by you to be considered in the light of a donation to the war.

By direction of the Acting Chief Signal Officer.
Henry Lockhart, Jr.,
Materials Department, Foreign and United States,
By H. K. S. Williams,
Hardwood Section.

The salary which S. B. Vrooman, Jr., had received from the S. B. Vrooman Company has been continued by that Company, and, when J. Edward McCullough entered the service of the Government, the George D. Emery Company paid until the arrangement mentioned below, the difference between his Government pay and his former compensation from the company.

It was soon arranged that the Mahogany Manufacturers and Importers' Association should assume the payment of the additional compensation to Mr. Wickliffe and to Mr. McCullough. Accordingly, for the period beginning with April this compensation was paid to both in checks from Mr. Huddleston, the Treasurer of the Association. The amounts were raised by voluntary contributions of various members of the Association. The minutes of the Association show the following action in the matter:

The matter of the difference in compensation between the amount paid by the Government for services to J. C. Wickliffe and to Mr. McCullough and the amount of compensation previously received was discussed. The following resolution was then presented, duly seconded and adopted by the affirmative vote of all present:

Resolved, That such excess compensation be paid by the various members of the association in the form of an annual subscription, which is made up by various amounts subscribed by the mahogany firms, amounting in total to fifty-seven hundred (\$5,700) dollars.

The motion was duly made, seconded and carried by the affirmative vote of all present, that a copy of this resolution be sent to Mr. H. K. S. Williams.

Mr. Wickliffe testifies that this arrangement was made "because it was felt that it was not right for any one individual firm to pay it all." Mr. Huddleston testifies that it was "purely a question of co-operation with Mr. Mengel." Early in May there was correspondence between H. K. S. Williams and Mr. Huddleston, the treasurer of the Mahogany Association, in which a letter in the following form, addressed by Mr. Huddleston to Mr. Wickliffe was first submitted to H. K. S. Williams and approved by him:

347 Madison Avenue, New York, N. Y.
May 10, 1918.

Mr. J. C. Wickliffe,
Materials Department, Foreign and United States,
Hardwood Section, Washington, D. C.

My dear Mr. Wickliffe:

A few days ago when the heads of the various mahogany importing and manufacturing concerns met for general discussion, attention was called to the fact that by virtue of your recent appointment as assistant to Mr. H. K. S. Williams, your annual income had been cut something in excess of fifty per cent.

After a general discussion it was agreed that it would not be fair that you stand alone the burden imposed on you by your services to the Government in this particular department, therefore, it was mutually agreed that the various mahogany firms, feeling as patriotic as you have demonstrated yourself to be, will make up the difference between your former income and what you are now receiving from the Government, provided such an act would meet with the approval of Mr. H. K. S. Williams, the head of your department.

I am pleased to advise you that I am today in receipt of a letter from Mr. H. K. S. Williams, approving of this transaction; so acting in the capacity of treasurer, I will mail you each month a check for \$350 beginning the month of April, which I am informed will make up the difference in your salary.

A similar letter was written, with the approval of H. K. S. Williams, to Mr. McCullough. Mr. McCullough was paid by the Association for April, May, June and July, at the rate of \$91.67 a month. He returned to his former employment early in August. In the case of Mr. Wickliffe, the arrangement continued until it was officially disapproved on August 20, 1918, by Mr. J. Gilmore Fletcher, on behalf of the Bureau of Aircraft Production, in the following letter:

War Department, Bureau of Aircraft Production,
Washington, Aug. 20, 1918.

Mr. J. C. Wickliffe,
Hardwood Section,
119 D Street, N. E., Washington, D. C.

My dear Mr. Wickliffe:

In view of the fact that the Government looks with disfavor upon your receiving from the Mahogany Manufacturers and Importers Association your present monthly remittance, which I shall refer to here as a salary of \$350 per month, I deem it best, and hereby request, that you immediately refuse to accept any further payments from that source, or any other source which comes in direct line with your duties in the Hardwood Section, the Raw Materials Department, Division of Aircraft Procurement, Bureau of Aircraft Production.

I shall at once take the proper steps to have the salary now paid by the Government, namely, \$4,000 per year, increased to \$8,200 per year, and shall make every effort to expedite a decision on the point of allowing you this increase.

Yours very truly,
J. GILMORE FLETCHER,
Chief of Aircraft Procurement.

Mr. Wickliffe immediately requested Mr. Huddleston to discontinue the payments, and accordingly there has been no payment of additional compensation since the payment for the month of July.

Early in February, 1918, arrangements were made with some of the manufacturers for the taking over of certain mahogany which had been under contract for delivery to British merchants, but the amount was relatively small. After H. K. S. Williams took charge of the Hardwood Section, and also after J. C. Wickliffe became his assistant, negotiations were continued with the manufacturers composing the Mahogany Manufacturers and Importers Association for the purchase by the Government of mahogany in large quantity for propeller stock. On the appointment of H. K. S. Williams, his brother, Thomas Williams (of Ichabod T. Williams and Sons) had resigned as president of the Association, and C. R. Mengel was elected in his stead.

On February 14, 1918, new specifications had been adopted by the Signal Corps (No. 15,028-A), modifying and liberalizing the prior specifications which had been adopted in the previous December. At about the same time (February 13th) the manufacturers had submitted two proposals, one under the Signal Corps specifications (No. 15,028-A) at \$400 per M feet for firsts, seconds and selects, and \$320 per M feet for lower grades, f.o.b. cars eastern mills (with corresponding prices for other points according to estimated freight rates), and another proposal under the 'National Hardwood' rules for specified sizes at \$350 per M feet for firsts, seconds and selects, and \$280 per M feet for No. 1 common, f.o.b. cars eastern mills. These had been refused. The important difference was with respect to the inspection.

In this situation, a conference was held on March 6th between the manufacturers and H. K. S. Williams, J. C. Wickliffe, and S. B. Vrooman, Jr., representing the Government.

The minutes of this conference show that H. K. S. Williams opened the meeting with the announcement that "it was the purpose of the Signal Corps to grant as liberal an inspection as could be given consistent, of course, with the principle that no lumber could be taken that would not make propeller blades."

After a discussion of the matter of utilizing lumber which showed scattered pin-worm holes, and the opinion having been expressed by Mr. Vrooman that such stock could be used where it did not affect the strength of the board, Mr. Williams stated that he would endeavor to have the Inspection Department accept such lumber. This, as Mr. Wickliffe, testifies, was accomplished.

The minutes show that Mr. Williams "stated that Mr. Vrooman is going to be in charge of the inspection all over the country; that he will appoint various men to do the inspecting at the various mills, and shall show them what is to be done."

Mr. Williams further stated that his object in having Mr. Vrooman at this conference was that "the interpretation of the Signal Corps specifications might be as easy as such interpretation could be made consistent with the principle of accepting only propeller material, but that the Government might get all such material that it could get."

Mr. Williams then requested that each manufacturer advise him of the cost of its logs placed alongside steamer at Central American and Mexican loading points, and these estimates were given.

Another conference was held on the same day between the manufacturers and H. K. S. Williams and J. C. Wickliffe, representing the Government, at which, after considerable discussion, Mr. Williams stated that he would recommend the payment by the Government of the following scale of prices on Mexican and Central American mahogany propeller stock under Signal Corps specifications No. 15,028-A, as follows: \$350 per M feet for first, seconds and selects, and \$280 for lower grades, f.o.b. eastern and middle western points, and \$330 and \$265, respectively, at New Orleans; and the same schedule of prices was stated for African mahogany f.o.b. eastern and middle western points. At these conferences Mr. Wickliffe was in attendance as Mr. Williams' adviser.

He reviewed the manufacturers' estimates and made calculations for Mr. Williams as to costs, and in view of his extensive experience there can be no doubt that considerable reliance was placed upon his opinion and advice. The terms of the contracts were virtually settled, in accordance with Mr. Williams' proposal, at the second conference on March 6th, and these terms were subsequently approved by Mr. Lockhart. The formal contracts were not made until sometime later. On March 26th the Aircraft Board recommended the execution of the contracts, on the above terms for the following quantities:

For African mahogany:

	Minimum	Maximum
Astoria Veneer Mills Dock Co.....	2,000,000	3,500,000
I. T. Williams & Sons.....	500,000	1,500,000
Palmer & Parker Co.....	600,000	1,500,000
C. C. Mengel & Bro. Co.....	2,800,000*	2,800,000
Talge Mahogany Co.....	2,130,000	2,450,000

For Central American and Mexican mahogany:

	Minimum	Maximum
Huddleston & Marsh Mahogany Co.....	1,750,000	3,000,000
Astoria Veneer Mills & Dock Co.....	1,500,000	2,500,000
Lewis Thompson & Co.....	1,500,000	2,000,000
Otis Manufacturing Co.....	1,000,000	2,000,000
Frieberg Lumber Co.....	500,000	1,250,000
I. T. Williams & Sons.....	750,000	2,000,000
Palmer & Parker Co.....	300,000	750,000
C. C. Mengel & Brother.....	2,800,000	2,800,000

*Amended to read 1,700,000 minimum.

On April 16 the Aircraft Board recommended the making of a contract with the S. B. Vrooman Company for Central American or Mexican mahogany, 500,000 ft., minimum, and 1,500,000 maximum.

It is hardly necessary to say that it was a gross impropriety for corporations or firms, either individually or collectively, to pay additional compensation to an employee of the Government, and for the employee to receive such compensation, for services in relation to contracts and transactions in which the corporations or firms were directly and pecuniarily interested.

It is not found, however, that there is any statute making this a criminal offense unless it is a case within the statute against bribery, or proves to be part of a fraudulent scheme to take advantage of the Government, or part of an endeavor to induce a violation of law.

The act of March 3, 1917 (*ante*, p. 25) making it a crime to pay additional compensation to an employee of the Government, or for an employee to receive such additional compensation, only applies to such contributions after July 1, 1919.

The occasion of this statute, it is understood, was criticism of payments of additional compensation made to experts in the employ of the Government, where, however, the employee in the Government service was not acting in matters in which the person or corporation contributing had any pecuniary interest or motive of gain.

Contributions for the support of those who have made sacrifices in undertaking war work for the Government are doubtless made in many instances, but there is no analogy between cases of this general description and payments of additional compensation to employees of the Government by those having direct pecuniary interest in the transactions in which the employee acts as the Government's agent.

But under the statute against bribery (Criminal Code, Secs. 39, 117) it must be proved that the payment was made or received with intent to influence the decision or action of the representative of the Government on a question which may be brought before him in his official capacity or in his place of trust or profit, or to influence him to commit, aid, collude in or allow a fraud, or to make opportunity for the commission of a fraud, on the United States, or to induce the employee to do or omit to do an act in violation of his lawful duty.

Whether in the present case, in the circumstances disclosed, any charge of this sort could properly be made would largely depend upon the question whether the terms and prices secured by the mahogany manufacturers were fair and reasonable, or could be deemed excessive and the result of improper influence. In view of the intimate relation of the representatives of the Government who took part in the negotiations to the manufacturers it is obviously appropriate that there should be a fair and impartial examination of the transactions by a body competent to make a survey and determination of questions of costs and profits.

Testimony has been given in the present inquiry tending to show that the prices were high. Lower prices under prior orders and offers are referred to. On the other hand, the manufacturers urge that in view of the peculiar conditions of the industry, the difficulties attending the procurement of logs, and the risks taken by reason of the small percentage of lumber suitable for propeller material, the prices and terms were in all respects fair; that Mr. Williams, Mr. Wickliffe, Mr. Vrooman and Mr. McCullough took their positions simply because of the necessity of having men in their respective places who were qualified by experience, and that throughout the transactions all the persons concerned have been moved solely by the desire to serve the Government.

It was manifestly impossible in the course of the present inquiry to make such a survey of the mahogany industry as to reach a satisfactory conclusion with respect to the cost of producing the required mahogany and as to the fairness

of prices and terms. This sort of investigation would require special facilities of the kind which are at the command of the Federal Trade Commission, and through its instrumentality it is believed that such a survey of the industry and a determination of fair costs and profits can be made. Upon its report as to the cost of producing the required mahogany it can readily be decided whether there is ground for prosecution by reason of the transactions which have been disclosed in this inquiry.

African Mahogany

Attention should be called to the fact that the contracts with the mahogany manufacturers called for considerable quantities of African mahogany. It appears that prior to the war large importations of mahogany had been made from Africa. Thus, in 1914, out of total importations of mahogany logs of 70,914,000 ft., there were 31,177,000 ft. of African mahogany. At the first conference with the Government representatives, on Jan. 21, 1918, as the minutes kept by these representatives show, Mr. Mengel had suggested the increased supply which could be obtained from Africa, and Mr. Leary (of Ichabod T. Williams & Sons) "described his efforts to induce the Signal Corps to use African mahogany." Offers of African mahogany were made in proposals by several of the mahogany manufacturers under date of March 6. Thus, in the proposal then sent to the Signal Corps by C. C. Mengel and Brother Company it was stated that his company had at Axim, Africa (on the Gold Coast) "awaiting steamers, 3,000,000 ft. of sound, fresh logs"; and also at Axim, "now in streams tributary to it, and available for the June rains, 4,000,000 ft.; and these logs, located as they are, and from the best information we have, pretty nearly sure to be delivered at Axim on the June rains, as they were put in pretty good, safe streams by our own men, in our own employ, and paid by us, and put in streams selected so that they would come out on light water."

The advisability of using African mahogany as propeller material, however, was far from clear. It was not regarded as within the original specifications, but the modified specifications adopted on Feb. 14, 1918 (No. 15,028-A) stated that African mahogany (*Khaya senegalensis mahogani*) was approved by the Signal Corps.

Despite this statement, the question was not regarded as settled. On Feb. 13, 1918, H. S. Betts, Acting Assistant Forester, in reply to a letter of Captain Oakleaf of the Signal Corps, stated that it was "undoubtedly true that the term 'African mahogany,' without further specifying as to kind of wood, would include several species which are inferior in quality for propellers"; but after referring to various tests, quoted a report from the Forest Products Laboratory that the African mahogany was "practically the equal of the General American species, and could be substituted satisfactorily for the latter."

On Feb. 26, H. K. S. Williams wrote to Major Gray of the Production Engineering Department that he was "anxiously awaiting information as to whether African mahogany has been approved for use for the manufacture of propellers for battle and bombing aeroplanes." He said that he had reported the matter a number of times to his superiors, and had been told to communicate with Major Gray, and after referring to communications he had received on the subject he asked for a reply by telegraph. On March 1 the Production Engineering Department telegraphed its answer to H. K. S. Williams as follows:

This department is not favorably disposed towards African mahogany for combat propellers and does not see why it should be shipped here and then back to Europe. Can not arrangements be made to have walnut for English diverted to our propeller manufacturers and to ship African mahogany to England? There is much poor African mahogany on American market. In any event for safe use African mahogany would have to be inspected at the source to make sure that we obtained the proper varieties and proper wood. We feel further that with provision for splicing which has been adopted there should be enough of other woods available to meet the propeller requirements.

Before this was received a telegram was sent on the same day to Major Gray, with the signature of the Materials Department, to the effect that they were "anxiously awaiting telegraphic reply to letter Feb. 26." And on March 2 the Production Engineering Department, notwithstanding the statements in its telegram of March 1, telegraphed to the Materials Department as follows:

Regarding use of African mahogany for combat and bombing airplane propellers advise that such wood is acceptable for use in these propellers.

And on March 16 the Airplane Engineering Department (by Mr. Caldwell, on behalf of Major Marmon) wrote to Major Gray of the Production Engineering Department, referring to tests of propellers made of African mahogany at Langley Field and McCook Field, and stated the following

order of preference for propeller woods: (1) walnut, (2) Honduras mahogany, (3) cherry, (4) African mahogany, (5) quarter-sawn poplar, (6) quarter-sawn white oak. Mr. Caldwell stated further that the following species of African mahogany were acceptable: (1) Grand Bassan, (2) Lagos, (3) Benin; also that there was an African wood similar to mahogany, known as "Iroko," which had been found acceptable in the English propeller construction.

On March 21 Mr. Caldwell wrote to Lieut.-Col. Horner of the Equipment Division, stating that they had definitely ascertained that the wood they had tested came from Axim, and that "this wood would be acceptable at least to the extent of 3,000,000 or 4,000,000 ft." Mr. Wickliffe, on behalf of Mr. Lockhart of the Materials Department, sent the following memorandum to the Contract Section on the same day (March 21):

It is only recently that the use of African mahogany has been authorized in the construction of propellers, and therefore the entrance of purchase request to cover the quantities of African mahogany shown in the attached proposals (of the mahogany manufacturers) has been withheld pending such authorization. Permission has now been received for the use of this wood and purchase requests are being sent to the Priority Section today covering the quantity of African mahogany shown in the proposals of Astoria Veneer Mills and Dock Co., Palmer & Parker Co., Ichabod T. Williams & Sons, and C. C. Mengel & Bro. Co.

In view of the heavy demand for shipping facilities, a serious question arose with the Shipping Board as to the necessity of getting in the African mahogany. In a conference between Mr. Karl deLaittre, representing the Shipping Board, and Mr. Sibley and Mr. Wickliffe of the Signal Corps, on May 4, Mr. Wickliffe's attention was called to the lack of shipping space, and he replied (according to the stenographer's minutes produced by Mr. deLaittre):

Yes, but this is a matter of contract. We make our contracts in good faith on both sides. It is not permissible for the Government to break these contracts; it would break the people making them. We cannot let these people down on the African product.

At another point in the conference Mr. Wickliffe said:

If the timber from Africa is not brought forward, coming in June, and is allowed to deteriorate, the first part that will be hit will be the outside of the log, out of which the aircraft material comes. If we do not get this African lumber, we have exhausted every resource in walnut and cherry and in Central American mahogany. We do not yet know as to the use of quarter-sawn oak. Then if we do not get this timber we cannot get any African logs before June of the following year.

Meanwhile the subject had been taken up for investigation by representatives of the War Trade Board and of the Forestry Service. Its importance lay in the fact that there was an abundance of white oak available in this country, and it developed that there was opinion of considerable weight in favor of the use of oak on combat propellers.

On June 2 a conference was held between representatives of the Production Engineering Department, the Airplane Engineering Department, the Propeller Inspection Department, the Propeller Purchase Section and the Wood Inspection Section of the Signal Corps. Mr. Caldwell, who had written the letter of March 21, represented the Airplane Engineering Department. Lieutenant Ryerson's memorandum of this conference contains the following:

The question of the advisability of, and necessity for, importing African mahogany was carefully considered and it was the unanimous opinion that it would be possible to meet our present and future propeller lumber requirements from domestic or South American supplies, and that because of the difficulty of inspecting African mahogany, its further use in propellers should be discouraged.

On Aug. 3, 1918, Lieutenant Ryerson of the Propeller Section, having been asked for a statement of the requirements of woods for propeller stock, requested the Production Engineering Department for "an up-to-date formal statement" as to the kinds of lumber to be specified for combat propellers, in their order of preference. This brought a reply under date of Aug. 7 from the Production Engineering Department, through Professor J. S. MacGregor (head of the Physical Testing Department, School of Mines, Columbia University) as follows:

Answering your memorandum of August 3rd requesting information on kinds of wood for propellers we advise you herewith that this department has authorized the use of the following woods for combat propellers. The list is given in the order of their preference:

- Black walnut.
- True mahogany (Honduras).
- Cherry.
- Quarter-sawn white oak.
- African mahogany.

The objection to African mahogany (aside from the shipping problem) was that it varied considerably in quality, and that inspection of it so far from its source would make it difficult to be sure that the right species was received

Throughout the controversy Mr. Wickliffe has expressed his views with considerable emphasis and has thrown the weight of his influence in favor of contracts for African mahogany and of the provision of shipping facilities to bring it in.

In support of his position he has produced a memorandum, under date of Aug. 23, signed by Charles Day, as special assistant to the Secretary of War, to the effect that "while oak propellers are being used with satisfactory results in connection with our training planes, they have not been adopted for planes for active service overseas on account of unsatisfactory results obtained abroad when their use has been attempted for any considerable period."

Mr. Wickliffe has also presented a letter under date of July 19 from Lieutenant Hollande, in charge of wood purchasing for the French Government, in which it is said that "we are buying a very great quantity of African mahogany in France direct from our colonies"; also a letter received from the office of the British War Mission giving information to the effect that "the home authorities propose during 1919 to use British Honduras and West African mahogany exclusively for propeller construction, cutting out walnut completely," and that demands from factories in England for propeller lumber are met "indiscriminately by the supply of either British Honduras or West African mahogany, the latter being considered as equivalent to the former for all purposes."

On the other hand, a very recent cablegram (Sept. 28) from the Scientific Attaché to the American Embassy in London in answer to an inquiry of the Research Information Service here, states that "authorities British opinion and practice placing walnut and Kanduranian, Nicaraguan, Cuban mahogany ahead of African. British would not use African if sufficient quantities of above were available. African used only in combination with other woods."

The statement to the contrary as to British practice is said to be incorrect, and it is added "British have not tested oak, cherry, poplar sufficiently to make comparison. American army wood experts now here state A. E. F. satisfied with oak and have advised Washington, D. C., accordingly. Poplar has also showed up well on tests. British unable to see any justification for U. S. using African mahogany in view of other furnishings available."

It is understood that ships for African mahogany were finally provided. Upon the evidence, it is apparent that the matter was the subject of discussion and presented grounds for differences of opinion.

The interest, however, of some of the leading mahogany manufacturers in obtaining contracts for the delivery of African mahogany is apparent, and while the efforts to induce its purchase and transportation may have been based upon the belief that the wood was better than that available here and that the supply was needed by the Government, the matter is one which should receive consideration in connection with the survey of the industry which has been suggested for the purpose of determining the fairness of the mahogany contracts and of the action taken under them.

3. Sabotage Act.—Grand Jury Proceedings

There have been occurrences in various plants indicating efforts to injure war material, or to make it defective, or to conceal defects, but on investigation it has generally been very difficult to find sufficient basis for criminal prosecution, either for lack of evidence as to the particular individual who had committed the act, or because on close examination it appeared that the condition of the material could be fairly attributed to carelessness, and evidence of criminal intent was wanting.

Hammondsport Plant of the Curtiss Company

In the course of this inquiry information was received that frequent attempts had been made to conceal defects in motors and their different parts which were in course of manufacture at the plant of the Curtiss Aeroplane & Motor Corporation, at Hammondsport, N. Y. Evidence having been obtained as to specific instances of this practice, there was an investigation in July last before a grand jury in the Western District of New York, John W. Ryan, Esq., of Buffalo, being appointed special counsel for the purpose, which resulted in the return of indictments against Lewis Longwell and Hector Bordeau, sub-foremen in the assembly room of the Hammondsport plant, under section 3 of the Sabotage Act of April 20, 1918. Demurrers to these indictments have been overruled and the cases are awaiting trial.

North Elmwood Plant

In view of the conditions found at the North Elmwood plant of the Curtiss Aeroplane & Motor Corporation, there was a special investigation through special agents of the Department of Justice for the purpose of discovering violations of

the Sabotage Act, with the result that evidence was brought before the grand jury in the Western District of New York, John W. Ryan, Esq., acting as special counsel, and indictments were obtained in September against Richard Eastman, foreman of the propeller department; Frank Truell, an assistant foreman, and David Rogovan, a workman, under the Sabotage Act. On Oct. 9 these defendants pleaded guilty and were fined \$500 each.

Liberty Iron Works.

Testimony given in this inquiry in relation to alleged irregularities at the Liberty Iron Works at Sacramento, Cal., led to a special investigation in charge of John W. Preston, Esq., Special Assistant to the Attorney-General, before the Grand Jury at Sacramento in September last. Considerable testimony has been taken, but no indictments have been returned.

4. Cross License Agreement as to Rights under Airplane Patents.

In view of claims under alleged patent rights, and with the object of facilitating aircraft production by providing for manufacture on a definite basis, a corporation was formed under the laws of the State of New York known as the Manufacturers Aircraft Association, Inc. This corporation entered into an agreement with its "subscribers," that is, its stockholders, called the cross-license agreement. The Government is not a party to the agreement, but it was recommended by the National Advisory Committee for Aeronautics, was endorsed by the Aircraft Board and received the approval of the Secretary of War and the Secretary of the Navy.

By the cross-license agreement, the subscribers grant to each other licenses under all airplane patents now or hereafter owned or controlled by them in the United States, its territories and dependencies (except foreign patents and certain specified patents); the corporation is designated as the agent of the subscribers to execute licenses accordingly; each subscriber agrees that it will not enter into any agreement or arrangement whereby its privileges under United States airplane patents or inventions will be diminished or surrendered so as to exclude or restrict the operation of the agreement, and that it will not grant licenses under any such patents for use in airplanes with reference to which it is receiving royalties under the agreement, to any other person, firm or corporation on more favorable or lower terms of royalty than those provided in the agreement, or which may become more favorable or lower during the term of the license.

Under the agreement in its original form, in providing for the payments to be made by subscribers, it is stipulated that each subscriber shall pay to the corporation \$200 for each airplane sold and delivered by the subscriber until the Wright-Martin Aircraft Corporation and the Curtiss Aeroplane & Motor Corporation (these corporations claiming to hold basic patents) had each been paid the sum of \$2,000,000. A supplemental agreement has since been made modifying the provision for payments by subscribers and providing that the aggregate payments to both the Wright-Martin Corporation and the Curtiss Company should be \$2,000,000 instead of \$4,000,000.

The agreement has been criticized upon the ground that its provisions constitute a hindrance to the progress of invention in the important airplane field and as being in restraint of trade. Whatever ground for criticism exists in this respect is to be found in the terms of the agreement itself, as these are quite definite and determine its operation and effect.

I shall not deal with the question of the legality of the agreement, as the question was specifically submitted by the Secretary of War to the Attorney General whether the association and the agreement were in contravention of the anti-trust statutes of the United States and the opinion was expressed by the Attorney General that they were not. That disposed of the question, in the absence of a contrary decision by the courts, so far as the action of the Executive department is concerned.

To the question whether the patents of the Wright-Martin Company and of the Curtiss Company are basic patents, and whether the payments for which the agreement provides constitute a proper compensation for the rights conferred, it would require an exhaustive examination of the patent situation to give a satisfactory answer, and this inquiry has furnished no opportunity for such examination.

For this reason no opinion is expressed upon the point further than to say that, if the validity of the agreement be assumed, the amount of the payments was a matter of sound administrative discretion, and there is no ground for the conclusion that the amount as fixed in the supplemental

agreement could not fairly be allowed. It is also asserted that the Government is left liable to other claimants, but this also requires an opinion upon the validity of certain patent claims which could not be dealt with in this inquiry.

General Conclusions and Recommendations

1. The controlling facts and the conclusions in relation to the matters reviewed have been stated under appropriate headings. It would be impossible to re-state them in a brief summary. The defective organization of the work of aircraft production and the serious lack of competent direction of that work by the responsible officers of the Signal Corps, to which the delays and waste were chiefly due, were matters for administrative correction through unification of effort under competent control. The provisions of the criminal statutes do not reach inefficiency.

It is not within the province of this report to make recommendations with respect to administrative policy, but it should be said that under the direction of Mr. Ryan and Mr. Potter there has been improvement in organization, and progress has been made in gratifying measure.

2. The evidence discloses conduct, which although of a reprehensible character can not be regarded as affording a sufficient basis for charges under existing statutes, but there are certain acts shown, not only highly improper in themselves but of special significance, which should lead to disciplinary measures. The evidence with respect to Colonel Edward A. Deeds should be presented to the Secretary of War to the end that Colonel Deeds may be tried by court martial under articles 95 and 96 of the Articles of War for his conduct (1) in acting as confidential adviser of his former business associate, H. E. Talbott, of the Dayton Wright Airplane Co., and in conveying information to Mr. Talbott in an improper manner, with respect to the transaction of business between that company and the division of the Signal Corps of which Colonel Deeds was the head; and (2) in giving to the representatives of the Committee on Public Information a false and misleading statement with respect to the progress

of aircraft production for the purpose of publication with the authority of the Secretary of War.

3. The absence of proper appreciation of the obvious impropriety of transactions by Government officers and agents with firms or corporations in which they are interested, compels the conclusion that public policy demands that the statutory provisions bearing upon this conduct should be strictly enforced. It is therefore recommended that the officers found to have had transactions on behalf of the Government with corporations in the pecuniary profits of which they had an interest, should be prosecuted under section 41 of the Criminal Code.

4. The Federal Trade Commission should be requested to report upon the proper cost of mahogany for airplane propellers, to the end that upon the coming in of its report the question of the propriety of further action with respect to the transactions of the Mahogany Manufacturers and Importers Association may be determined.

5. It is recommended that the representatives of the Department of Justice should keep in touch with the progress of the re-audit of accounts so that it may be advised of the complete enforcement of the rights of the Government in final settlement of accounts, and that the Government has been fully protected against unnecessary loss through waste and the absence of suitable factory supervision.

6. Permit me also to suggest that a special division, or sub-division of the present Bureau of Investigation, in the Department of Justice should be assigned to the consideration of suggested delinquencies in connection with aircraft production so that the work already done may be appropriately followed up. In particular, it is recommended that the activities in relation to Spruce Production, which being largely centered on the Pacific Coast it was impracticable to embrace in the present inquiry, should be carefully scrutinized.

I have the honor to remain,

Respectfully yours,
(Signed) CHARLES E. HUGHES.

Statement by Attorney-General Gregory

October 31, 1918.

THE PRESIDENT,
The White House.

Dear Mr President:

On May 6 last, you directed me to investigate and pursue charges of dishonesty or malversation in regard to the production of aircraft and, on May 13, you asked Judge Charles E. Hughes to act with me in making this investigation. By far the larger part of the last five months has been consumed in taking testimony. An opportunity has been given to every person claiming to have grievances, charges, or criticisms, to appear and testify in person or produce other witnesses and data.

We spent many weeks in personally inspecting conditions and taking testimony at the larger plants having aircraft contracts with the Government at Dayton, Ohio; Detroit, Michigan; Elizabeth and New Brunswick, New Jersey; and Buffalo, New York. The papers, books, correspondence, accounts and other records in the files of the Signal Corps at Washington, as well as those of the principal contractors and of the Government at these plants, have been critically examined as far as there was reason to believe that they would throw light on the matters under investigation. We have examined nearly three hundred witnesses and taken about 17,000 pages of testimony.

In an effort to make the investigation thorough, we have attempted to go into every phase of aircraft production since our entry in the war in April, 1917, and had recourse to every source of information which appeared available.

Every complaint or charge of wrongdoing has been heard and carefully considered. It is believed that the investigation has been exhaustive, except that full data as to contracts let abroad for planes has not been at hand, and the matter of spruce production on the Pacific Coast has been gone into only to the extent that this could be done by the examination of witnesses at Washington.

From the investigation made, it has been concluded that the taking of the additional time necessary for obtaining complete data from Europe in regard to the contracts in question, or for a trip of investigation to the Pacific Coast where most of the spruce is produced, was not justified. During the period referred to, Judge Hughes has given practically his

entire time to this work and has been in direct charge of the investigation, which has been conducted by him with the cooperation of myself and other officials of the Department of Justice. The investigation has now been completed.

Some three weeks ago, at the conclusion of the taking of testimony, in order that you might have the independent judgment of both, Judge Hughes and I, each without conference with the other, considered the evidence, reached his own conclusion and prepared a report.

On the afternoon of last Saturday, Oct. 26, Judge Hughes handed me a copy of his report, together with a letter asking me to transmit it to you with whatever statement of views I wished to make.

The report consists of 182 printed pages. By far the greater portion is devoted to a remarkably accurate statement of substantially all the transactions had since the beginning of the war in the course of the development of the aircraft program. After carefully examining this statement of the transactions had, I find myself in substantial accord therewith and do not consider it necessary to present to you a somewhat full report which has heretofore been prepared in the Department of Justice. As hereinafter shown, I also find myself in accord with the conclusions presented by Judge Hughes on questions of dishonesty and malversation.

I do not consider it germane to this investigation to enter into criticisms of the program or of mistakes in policy or in the exercise of judgment.

I send you herewith Judge Hughes' report and present herein my conclusions and briefly supplement Judge Hughes' findings of fact in a few instances.

General Character of Charges

When the investigation began in May, it was sweepingly charged that \$691,851,866.47, appropriated for the fiscal year beginning July 1, 1917, had been expended with practically no results; that members of the aircraft boards had been financially interested in aircraft contracts; that German and disloyal influences had retarded the progress of the work, and that these influences, together with graft of various kinds, had entered into the transactions involved. It therefore seems desirable to state briefly what sums have been expended and what has been accomplished.

Amount Expended

The \$691,851,866.47 appropriated was all for aviation purposes, including many things besides the building of aircraft. Contracts for airplanes and motors let here and abroad, it was estimated, would require \$474,910,706.55, but in May last this amount had by no means been expended. The actual disbursements for this purpose up to the close of the fiscal year ending June 30, 1918, were as follows:

For production in this country.....	\$106,741,490.77
For production abroad.....	25,605,074.31
For experimental and development work....	1,697,830.19
Total	\$134,044,395.27

This amount includes not only the cost of planes and motors delivered, but also large payments for special tools and for labor and materials in planes and motors not then finished. The figures are not now available to show just how much more has been disbursed on this account since June 30, though the total amount disbursed for all aviation purposes between that date and Sept. 30 was \$139,186,661.33.

Planes and Motors Acquired

To provide for the needs of the Army until production in this country could be expected, contracts were let, in the summer of 1917, in France for 875 training planes with engines and for 5000 service planes and 8500 service engines, deliveries to begin in November and be completed in June, 1918, and in Italy for 700 service planes with engines. These contracts were not carried out as contemplated, partly because of unavoidable delay by this Government in delivering materials, but largely because the unexpected increase in the needs of the French Government overtaxed the capacity of the manufacturers. However, up to July 31, 1918, there had been acquired under foreign contracts 1617 training and 1512 service, or a total of 3129, planes with engines. The deliveries of planes and engines produced in this country up to July 1, 1918, were:

Planes		
Elementary training	4,572	
Advanced training	1,046	
Service	553	6,171
Engines		
Elementary training	7,662	
Advanced training	2,579	
Service	2,392	12,633

Since July 1 production has been such that up to Oct. 11, 1918, the figures were:

Planes		
Elementary training	5,187	
Advanced training	2,137	
Service	2,350	9,674
Engines		
Elementary training	10,256	
Advanced training	4,479	
Service	9,937	24,672

When the 3129 acquired abroad are added, we have total planes 12,803, and 27,801 engines. While the only service planes thus far produced in this country have been observation and bombing planes, those acquired abroad include pursuit and combat planes.

Conduct of Members of Aircraft Boards

making of enormous quantities of machinery and tools, and the development of an industry almost unknown in this countless conflicting information from abroad, the proper types of planes and engines, securing responsible and efficient contractors to engage in a new line of work, the designing and

The results, as above set out, in view of the inherent difficulties of hurriedly expanding the Signal Corps from almost nothing to an immense organization, selecting, upon more or try and undergoing constant changes abroad, cannot be said to indicate dishonesty or malversation.

An exhaustive examination into the entire conduct of aircraft matters fails to show that any member of either board has had any desire to retard or delay production, or has done anything intended to accomplish that result, or has intentionally caused the waste of funds, or been actuated by a disloyal motive, or been guilty of dishonesty or malversation, unless there be truth in the specific charges which will now be referred to.

A. Interest in Contracts

I agree with the conclusion reached by Judge Hughes that there is no evidence upon which it can fairly be charged that any member of the aircraft boards, including Mr. Howard E. Coffin, General Squier, Col. E. A. Deeds, Col. R. L. Montgom-

ery, Col. S. D. Waldon, Mr. Richard F. Howe, Mr. Harry B. Thayer, Admiral Taylor, and other naval officers, has been unlawfully interested in any contract or transaction relating to aircraft production. Indeed as to this charge, there has, at no time, been ground for a question involving any of these gentlemen except Colonel Deeds.

B. Form of Contracts

Growing largely out of the popular understanding that contracts for aircraft provide that the compensation of the contractor shall be a fixed per cent of the cost of production, and thus make it to the interest of the contractor to increase that cost, the charge has been made that these contracts are themselves instruments for practicing frauds upon the Treasury.

The fact is that no such contracts have been made. The Government is to pay the cost of production plus a fixed sum, which cannot be enhanced by increasing the cost of production. On the contrary, it is provided that the contractor shall share in the saving if the actual cost shall be less than an "estimated cost" stated in the contract. Hence, whatever other objections there may be to the contract, it is to the interest of the contractor to keep the cost of production as low as possible. Moreover, the right is reserved to the Government to terminate the contract at any time by repaying the amount expended plus the fixed profit on finished articles and 10 per cent of the cost of labor and materials in unfinished articles. If, therefore, experience should demonstrate that the contract would be unfair, the Government could terminate it unless the contractor would agree to a readjustment of terms.

In the case of the Liberty motor contracts, the practical result has been first a reduction of the estimated cost from \$6,087 to \$5,000 and of the fixed profit from \$913 to \$625, and finally the putting of the contracts on a fixed-price basis when experience had shown what would be a fair price.

In view of the fact that when this form of contract was adopted there was no available data as to what the cost ought to be, it seems to have been devised to protect the interest of the Government. I am unable to see how an inference of bad faith or official dereliction can be drawn from it.

C. Awarding of Contracts

There have been charges of unfair discrimination and favoritism in the awarding of contracts. These complaints relate almost entirely to contracts for planes, for which there were many applicants. Selections had to be made. It cannot be said that plausible reasons were wanting for those made. If mistakes were made nothing has been developed which would justify the charge that they resulted from corrupt motives.

D. Profits of Contractors

It has been charged that exorbitant profits to contractors have been allowed. On their face, they appear to be unusually liberal, but when it is remembered that 60 per cent or more of them must be paid to the Government as income and excess profits taxes, and that most of the net profits will be invested in buildings and facilities which may or may not be capable of profitable use for an indefinite period after the termination of the contract, my conclusion is that no such profits have been allowed as to justify a charge of bad faith.

E. Cross-License Agreement

Whatever may be said of the charge that this arrangement tends to discourage future inventions, one of its results was to enable the Government, through contractors, to secure the use of all the necessary patents at a fixed cost and with little friction. It was not entered into until the Attorney General had given an opinion that it did not conflict with the anti-trust law. I find no basis for the suggestion that in bringing it about the members of the aircraft board were actuated by any unlawful or dishonest motive.

F. Conduct of Col. E. A. Deeds

Of all the members of the aircraft boards, the one most severely criticised and against whom most charges have been brought has been Col. E. A. Deeds. The evidence does not disclose any violation by Colonel Deeds of the criminal laws. In the early part of 1918, public statements were issued with official authority purporting to set out the progress which had then been made in the production of engines and planes and the prospects of the immediate future. These publications were not only misleading, but they contained false statements, and were issued in reliance upon information principally furnished by Colonel Deeds, who was acquainted with the actual facts. While the conduct of Colonel Deeds in this

matter was not criminal and cannot be said to have affected actual production, it was inexcusable and reprehensible.

I also find that Colonel Deeds was guilty of censurable conduct in acting as confidential adviser of H. E. Talbott and in conveying information to the latter with respect to transaction of business between the Dayton Wright Airplane Company and the division of the Signal Corps of which Colonel Deeds was the head.

Whether or not Colonel Deeds should be subjected to disciplinary measures for the acts referred to is a matter to be determined by the War Department. I acquiesce in the recommendation of Judge Hughes that the facts be submitted to the Secretary of War.

Officers and Employees of the Signal Corps

When war was declared and the carrying out of the aircraft program was entrusted to the Signal Corps, its official personnel was hurriedly increased from a small organization to one of enormous proportions. It has been impossible, of course, to critically examine the conduct of all the military officers and civilians connected with this branch of the service. The official acts of the more prominent ones have been gone into and the general situation has received as much consideration as was possible. The investigation has failed to show, unless the instances hereinafter noted constitute exceptions, that any person, military or civilian, connected with the Signal Corps, has desired to retard or delay production, or has done anything intended to accomplish that result, or has intentionally caused waste of funds, or has been actuated by disloyal motives, or been guilty of dishonesty or malversation. The incidents referred to are as follows:

A. Conduct of Lieutenant-Colonel J. G. Vincent, Lieutenant-Colonel George W. Mixter, and Second Lieutenant Samuel B. Vrooman, Jr.

Many successful business men tendered their services to, or were invited to take part in the activities of, the Signal Corps. Naturally the men selected were chosen as far as was practicable from lines of business similar to those in which the Government expected to utilize their services.

With the business interests of the country so largely involved in war work, many of these men, in the course of the performance of their official duties, not infrequently were brought in contact with corporations in which they held stock. It is to their credit that only three instances have been found in which officers or employees of the Signal Corps have apparently transacted business for the Government with corporations in which they were interested.

One of these was Lieutenant-Colonel Vincent, who had been vice-president of the Packard Motor Car Company, in charge of engineering, and who, after he became an officer in the Signal Corps, continued to hold certain shares of stock in that company.

He was one of the original designers of the Liberty motor, held several important positions in the engineering department, and is now in charge of the Airplane Engineering Division of the Bureau of Aircraft Production. Under the circumstances set out in Judge Hughes' report, Lieutenant-Colonel Vincent was instrumental in having certain payments made to the Packard Motor Car Company for drawings, models, tests, etc., and for eleven standardized engines.

The course of procedure which resulted in the payments of this money was without a written contract and otherwise irregular and unusual. I agree with Judge Hughes' conclusion that Lieutenant-Colonel Vincent violated Section 41 of the Criminal Code, which prohibits any person, directly or indirectly interested in the pecuniary profits or contracts of a corporation, from acting as an officer or agent of the United States for the transaction of business with such corporation.

I further agree with Judge Hughes that the evidence does not afford ground for the conclusion that the Government was defrauded, or that there was any intent to defraud on the part of any of the parties concerned, or that the services rendered were not worth the amount paid therefor, or that the estimates of the outlay of the Packard Company were not fair estimates.

Lieutenant-Colonel George W. Mixter held twenty-five shares (par value \$2,500.00) of the preferred stock of the Curtiss Airplane and Motor Corporation. This corporation had important contracts with the Government for the production of airplanes. While holding this stock, Lieutenant-Colonel Mixter was in charge of the organization for the inspection of materials and products at one of the corporation's plants, and visited it from time to time in the exercise of his authority as head of the Inspection Department and as Production Manager.

He stated on examination that he had bought a small

amount of common and preferred stock of the of the corporation mentioned some years before and remembered selling some of it, that he did not remember whether he retained any and had not thought of it after entering the service. It appears that he had parted with ownership of the common stock, but still owned the preferred. I agree with the conclusion of Judge Hughes that this was a violation of Section 41 of the Criminal Code.

Second Lieutenant Samuel B. Vrooman, Jr., was the owner of \$10,000.00 in par value of the stock of the S. B. Vrooman Company, of Philadelphia, which had a contract with the Government for supplying mahogany. While holding this stock, Lieutenant Vrooman was put in charge of the inspection of propeller lumber, including mahogany.

He elected the district officers, who in turn selected the inspectors; he issued instructions to the district officers and visited various plants to see that the inspectors were doing their duty and to pass on disputed points. The plant of the S. B. Vrooman Company was one of those subject to his jurisdiction but he denies that he ever personally inspected its lumber. I agree with Judge Hughes' conclusion that he violated Section 41 of the Criminal Code.

B. Conduct of Mahogany Manufacturers and Importers Association.

For a short period of time J. C. Wickliffe, J. Edward McCullough, and Second Lieutenant Samuel B. Vrooman, Jr., while representing the Government in dealing with mahogany manufacturers, received from one or more of these manufacturers salaries in addition to those paid by the Government. I agree with Judge Hughes that under the circumstances this was a gross impropriety on the part of those paying and those receiving the additional salaries, but that there is no statute making it a criminal offense unless a case is made out of bribery or of a conspiracy to defraud the Government. I am likewise of the view expressed by Judge Hughes that whether a charge of the sort indicated could be properly made would largely depend upon whether the terms and prices of the mahogany manufacturers were fair and reasonable, or excessive and the result of improper influence, and that the Federal Trade Commission, with its special facilities for conducting an examination of that kind, should be requested to make a survey of the mahogany industry and the cost of delivering the lumber involved and reach a conclusion as to the reasonableness of the prices paid.

C. Matters of Minor Importance

In one office of the Signal Corps there seems to have been discovered petty graft fostered by a civilian employee, and evidence has been brought to our attention tending to establish dishonest inspection on a rather small scale in one of the least important plants. These matters are now under investigation by grand juries and indictments will be found if justified.

Contractors

A searching inquiry has been made into the conduct of the work by the principal contracting companies. Agreeing substantially, as I do, with the statement of facts made by Judge Hughes, I am of opinion that it cannot fairly be charged that a managing officer of any contracting corporation has desired or attempted to delay production or been actuated by disloyal motives. To what extent, if any, inefficiency or mismanagement is to be inferred from the facts stated, I do not deem it within my province to determine.

German Sympathizers

In some of the factories a considerable number of alien enemies and persons of German birth or descent, who, at least before our entry into the War, were German sympathizers, have been employed. No facts have been developed which would justify the belief that these men have been retained through any willingness on the part of their employers to have production retarded or defective planes produced. On the contrary, the Government itself provided a system of permits under which they could be used.

They were employed and retained because the manufacturer felt that the great difficulty of obtaining skilled laborers in sufficient numbers justified such risk as might be incurred. In some instances the employer had faith in an old employee and was unwilling to discharge him because of mere rumors as to his loyalty. As an illustration of this, the head of the drafting department at the Ford Company's plant was of German birth and there were such persistent rumors that he was pro-German that some of the officers of the company thought it unsafe to retain him.

He had been in the employ of the company for nine years, professed to be loyally interested in the work, and the officers referred to testified that nothing definite could be proved against him. Mr. Ford stated that, at a time when all citizens were called to make sacrifices, one of German birth might do so by helping to produce motors to be used for his adopted and against his native country.

He stated further that he had absolute confidence in this man's loyalty and, in the absence of any proof of disloyalty, refused to discharge him. While this indicated the indicated the application of an almost idealistic policy of being just to employees, results seem to have justified the course pursued.

Though this man has been the object of the greatest watchfulness on the part of officers of the company who suspected him, nothing has been discovered indicating that he has been other than a loyal and efficient employee.

It is fair to say that no sinister or disloyal influence has affected production in the Ford plant. The factory manager testified that there had been no sabotage and no efforts to retard production. Results in the Ford Motor Company compare favorably with those in the best of the companies manufacturing Liberty motors.

Its contract for 5,000 motors was let in November, 1917, nearly three months after contracts had been let to the Packard and Lincoln companies for 6,000 each. Up to October 11, 1918, it had produced 1,868, while the Packard Company had produced 3,864 and the Lincoln Company 2,787. Not a case of sabotage has been reported to the Department of Justice from this plant. Indeed it can be said that but little trouble has been traced to aliens or alleged German sympathizers in any of the plants.

Sabotage

To what Judge Hughes has said on this subject, I wish to add that since his report was handed to me I have had the records of the Department of Justice examined for the purpose of ascertaining the number of substantial complaints of sabotage in the factories engaged in manufacturing aircraft, motors, or parts for the Government.

The result shows twelve such complaints. Upon these complaints and the investigations which followed seven men have been indicted, two of whom have pleaded guilty and five of whom are awaiting trial. In this connection, it is interesting to note that during the past eighteen months somewhere between 100,000 and 200,000 laborers have been engaged on Government work in the factories indicated.

Respectfully yours,

(Signed) T. W. GREGORY,
Attorney General.

Hughes Report a Vindication

(Continued from page 744)

that the plant is a permanent one admirably designed for commercial work, and that there is every prospect that it can be successfully utilized."

In summarizing, the report adds "the large percentage of the contractor's profits which will be taken by the Government in taxation should fairly be taken into account, but the contemplated tax does not justify an extravagant scale of profits which, even after payment of taxes, would permit an excessive return upon the capital invested in view of the greatly reduced risks of the contractor under the cost-plus contracts."

Under the latest revised contract with the Lincoln Motor Co. and others dated July 1, 1918, however, the Liberty engine price has been fixed, according to the report, at \$4,000 per engine, and hence the profits estimated above are accordingly reduced by 20 per cent. On this basis the Lincoln company will earn \$11,250,000 on a contract of 9000 engines to be delivered by April 1, 1919.

Labor conditions were found to be generally unsatisfactory. Turnover at the Packard plant, for example, was found to be at the rate of 400 to 600 per cent a year, 40,000 to 60,000 men coming and going in a year in order to maintain an organization of 10,000 men. Similar conditions were found elsewhere and in a number of plants difficulties caused by labor organizations; objections to women workers was encountered. Where women have been employed the results are pronounced satisfactory.

Extravagant labor costs were found in a number of factories, particularly in the North Elmwood plants of the Curtiss company, and due principally to the employment of more workers than were necessary.

Some alien enemies were found to be employed in the Packard, Wright-Martin and Ford plants, the Ford company having 250 German aliens engaged in war work, operating under special permits granted on the company's recommendation. A few instances of trouble as a result of this have occurred.

Objections are stated in the report to the payment of "exorbitant" salaries to executive officers, and Talbott and Kettering of the Dayton-Wright Airplane company are mentioned as drawing annual salaries aggregating \$100,000, while Mingle of the Standard company, who was to be paid at the rate of \$63,000, has thus far been allowed at the rate of \$15,000 per year.

The Mahogany Manufacturers' and Importers' Association, formed to co-operate with the Government and meet the demands for wood for propeller manufacture, comes in for some criticism due to the prices asked for mahogany and also to the fact that some members of the industry have received money from the association while at the same time accepting compensation from the Government. *There is no criminal act in this, according to the report, but there would be if bribery existed.*

BRITISH experience has demonstrated the value of the piece rate system as an incentive to output. Observations of speed under a piece-rate system also point to the conclusion that maximum production is best secured from women employees by piece-rate payments. Yet this very eagerness to secure high wages and unwillingness to take advantage of rest periods suggest the danger of such an incentive unless proper health supervision is assured.



THE entire lower peninsula of Michigan has been divided into thirteen districts in accordance with plans perfected under the direction of the War Industries Board. A chairman has been appointed for each district to act as the point of contact with the general supervisor, Allen A. Templeton. The entire state organization is styled the Regional Industrial Commission and was organized for the purpose of obtaining war contracts for such manufacturing concerns as were in a position to accept them and had the required facilities for production. According to the War Industries Board fully 60 per cent of the war work in this state is produced in District No. 1 and surrounding territory. About 25 per cent is produced in the Jackson district. This means that 85 per cent of Michigan's output of war work comes from the southeast corner of the state.

Analysis of Automobile Merchandising in New Zealand

PART III

Service Was Started with American Car Sales—Good System of Macadam Roads
Linking Cities—Possibilities of Truck Sales—Leading Industries

By G. A. Worrall*

AT the present time there is a remarkable situation existing. Horse feed is extremely high, as well as leather, iron for horseshoes, and labor, which makes the use of the horse almost impossible for carting and hauling at former rates. On the other hand, it costs 40 per cent of the list price to land a truck to-day, gasoline is \$5.50 to \$6 per case of 8 Imperial gallons, and the type of man who can operate a truck is almost impracticable.

In Christchurch, which lies on a level plain, and to which electricity is furnished by water power, the electric truck has become very popular. Garage and maintenance charges for one month are only \$3. With this in mind, we can turn to the City of Melbourne, Australia, which city has sold all of its motor trucks and replaced them by horse drawn vehicles.

On the whole, New Zealand is extremely mountainous, which calls for a motor with plenty of power.

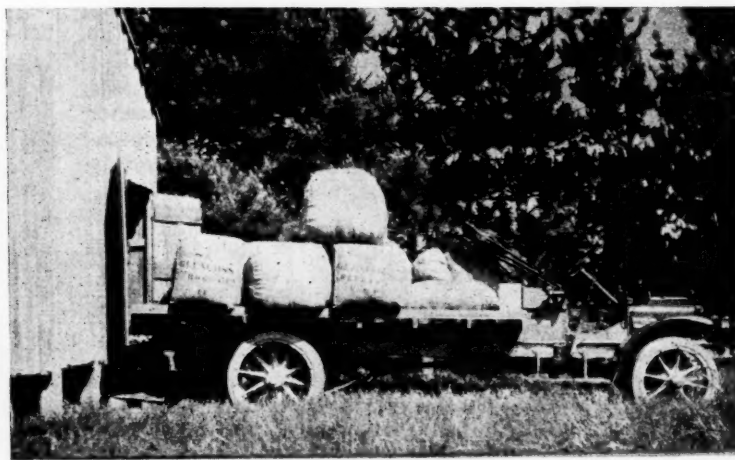
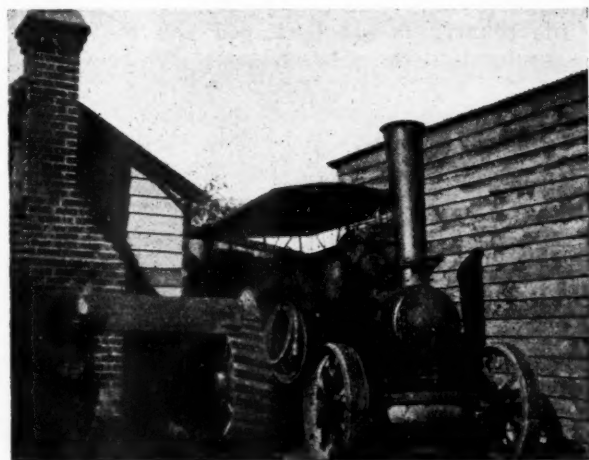
The truck market has only been touched. Up to the present day the demand has been created for them by the city carrier or drayman and the country carrier. Besides the further development of this field there is a much larger field in sight, namely, passenger transportation, sight-seeing, mail and passenger service, and the various merchants engaged in indenting and numerous factories all located in the larger centers. Also the ever-progressing dairying and flax industries are now making demands for rapid transit.

*Mr. Worrall spent 11 months in New Zealand as special representative of the foreign department of the White Co. He traveled on both islands and studied conditions for automobiles and trucks.

The bulk of the present users handle the wool during the wool season, which runs from November to February. During that period over 100,000 tons or 35,000 loads of wool must be brought to the railway depots from the inland districts, and shipped to large distributing centers, where it is again moved to the shipping docks. The hauls vary from 1 to 50 miles, and the scale of prices varies also. An average example is 70 cents per bale of 336 to 450 lbs. for a run of 14 miles, with a load of seventeen bales. The ideal truck for this work is the 5-tonner, but the bridges will not in all cases support them; therefore 3-ton or 3.5-ton is in general use, equipped with a 35 to 45-horsepower motor.

The season during which the wool is moved is delightful. During this period, while there is plenty of rain to keep the roads in good condition, it is never excessive. However, during the winter months, June to October, there is an abundance of rainfall, which makes many of the roads in the back districts impassable. During this period the carrier must be on the alert to find contracts to tide him over. The country carrier usually transports freshly fallen timber to be used as firewood, or to be sent as material to be used for fence posts, and on his return trips he carries the daily supplies for the farmer, finished fence posts, fertilizer, and building materials for new construction work, while the city carrier must contract for bulk work, or make special prices for general haulage work with large coal or meat companies.

It should be borne in mind that in New Zealand the long ton or 2240 lbs. is in general use, and the short ton used in America is rarely, if ever, used. The American



Left—Tractor engines were used for drawing wool, but are passing out and the truck is taking their place. New roads are bringing ordinances against these heavy iron tires. Right—Loading truck with wool in bales of 300 to 600 lbs. All station owners have presses for compressing the wool



Mt. Egmont in Taranaki, which is the center of the province. There is a 100-mile metal road around it. This is a progressive road area. It is a dairy country

truck maker must sell his truck on the long-ton rating rather than on the short-ton rating.

Pressed-on solid tires are best for all New Zealand, as all centers of population have tire presses for removing or fitting such tires.

New Zealand's Industry

Wool is the foremost industry of New Zealand. It is transported from the back or interior districts by steam tractors, horse teams and motor trucks. Not infrequently it is brought part of the journey by horses, and, when good roads are reached, transferred to motor trucks. More high-grade wool is exported from New Zealand than from any other section of the world.

To-day all the lumber is brought from the island by steam tractors and horse teams to the commercial centers. Motor trucks have not been able to engage in this work because of road conditions in the interior. Although the two islands have 2800 miles of narrow-gage railroad and an exceptionally long coast line there is still a good opportunity for greatly increased use of motor trucks in the lumber industry.

Possibilities for motor trucks in New Zealand cities are much the same as those in cities of corresponding population in different countries. Auckland, the largest city in North Island, with a population of 102,000, is a distributing and commercial center with large ship-building ways, sugar refineries, pottery factories, timber mills, etc., and offers a field for motor trucks much the same as any city of corresponding population. In this island is Wellington, with 70,000 population, which is a distributing and commercial city operating on a smaller scale. Christchurch in the South Island, with a population of 78,000, is also a commercial and distributing center with many small factories.

The frozen meat industry is an important one and generally the meat has to be transported from the freezing establishments to the wharfs for oversea shipment.

Butter and cheese have to be brought from inland dairy factories, which are numerous, to the cold storage houses at the seaport.

In addition to the larger cities mentioned there are in all of the provinces small cities with populations from 10,500 down. These cities have importance in the motor truck field in that they are shipping points for wool, which is generally transported from the station owner or sheep raiser's farm to these towns or cities.

Although the two islands of New Zealand, having a total overall length not exceeding 1000 miles and the

greatest width 250 miles, would, in ordinary circumstances, be an easy area to distribute over, nevertheless the fact that the country is divided into two islands, the North Island and the South Island, and also due to the fact that there are only 3200 miles of railroad on the two islands, it is impossible to cover the two islands from one distributing center, and the problems of distributing automotive apparatus thus becomes more involved than in many countries of much greater area, where there is one city that can be looked upon as the major distributing center for the entire area.

American manufacturers of any kind of automotive apparatus, such as farm tractors, trucks, cars and accessories, will have to appoint practically four distributors for the two islands and have direct factory connections with each of these four. The two islands are practically the same size, each approximately 500 miles in length, and in the North Island Auckland and Wellington are the two centers in each of which a distributor should be appointed. The South Island has two distributing centers, Christchurch and Dunedin. These are the four leading cities of the island and have distribution facilities to approximate one-quarter of the total area of New Zealand. Three of these centers are served directly by ocean liners which call at Auckland and Wellington in the North Island and Dunedin in the South Island. Christchurch on the South Island receives its shipments by transshipment from Wellington, or in case of large shipments they can be landed at Littleton, which is the seaport for Christchurch.

The territories served by each of the four distributors located in these centers are practically alike so far as the fundamentals of carrying on business are concerned, the carrying of spares, regulations concerning imports, and types of vehicles used. In all four areas the five-passenger touring car is the popular vehicle and the closed car has scarcely started. There is a very limited demand for two- or three-passenger runabouts.

Wellington a Big Motor Truck Center

Motor trucks have at present their biggest field in territory served by Wellington, which is the southern portion of the North Island. This territory has more motor trucks than the remaining three distributing areas combined. This is because the Wellington district is well supplied with railroads. It contains the center of population of the islands and the wool industry, which is the principal one of the islands located in this area. The northern portion of North Island, which constitutes the Auckland distributing area, is a poor motor truck field because the country is not developed and the use of trucks is confined to the areas adjacent to the city of Auckland, with its population of 100,000.

The Christchurch area is roughly the center portion of the South Island, a territory embracing the Province of Canterbury, which is approximately one-quarter of the island. This is largely devoted to agriculture and stock-raising, and the truck field is limited to the city of Christchurch, with its population of 80,000, and to the station owners or sheep raisers whose wool has to be transported to Christchurch for shipment.

Christchurch is particularly well suited for electric trucks because the city is level, being located on a plain. The municipality owns its water power and is prepared to furnish cheap electric current. So low is the electric rate that a 2 or 3-ton truck can be charged and stored for not more than \$3 per month.

The Dunedin distributing area, which is, roughly, the lower quarter of the South Island, is a poor area for motor trucks in that the country is not so well developed. The land is largely pastoral and exports are agricultural

products and frozen meats which call for the limited use of motor trucks in transporting to seaport.

The distributors in each of these four cities have dealer organizations similar to those in any distributing territory in America. For example, the Wellington distributor has in his territory perhaps ten cities of population in excess of 10,000 each, and in each of these has a dealer, agent, or branch where showrooms, garage and repairshop are centered. The stock of spares is generally carried with the Wellington distributor. He reaches practically all of his territory by railroad, the map, printed in a previous installment, giving a good indication of the places served. The Wellington distributor serves the northern part of the South Island or the Province of Marlborough and Blenheim, and these are served by connecting boat lines.

The Christchurch distributor handles his field generally, but has fewer cities of this population. The same applies to Auckland and Dunedin. Like the other countries south of the equator, where the seasons are diametrically opposite to those in the United States, the selling season is reversed. Here it begins in November and the height of the season is reached at the period of maximum wool movement, which comes in January and February. It is during this period that the distributor must have his stock of cars on hand for immediate shipment to dealers and when he must be stocked up with repairs.

The selling propaganda of the passenger car distributor begins late in October and is continued until March. The circuit of local fairs, which has become an important selling factor, begins in October and continues until March.

Truck Selling Period in New Zealand

The truck selling period is somewhat different. The best selling months are November and December, so that the distributor begins his selling propaganda the latter half of September and early in October. Trucks are sold all months of the year more or less, but the peak comes in November and December, because the wool movement starts in November and continues during November, December, January and February. All New Zealand dealers outside of the four distributing centers stock cars and have them ready for delivery. With trucks this has not been done until very recently, but to-day several of the dealers are stocking. The enterprising distributors in the four large centers are well supplied with repairs, which are carried uniformly during the twelve months of the year.

The majority of motor cars sold in New Zealand during the last few years have been cash transactions, but



Driving sheep to the slaughter house. They are driven as far as 100 miles

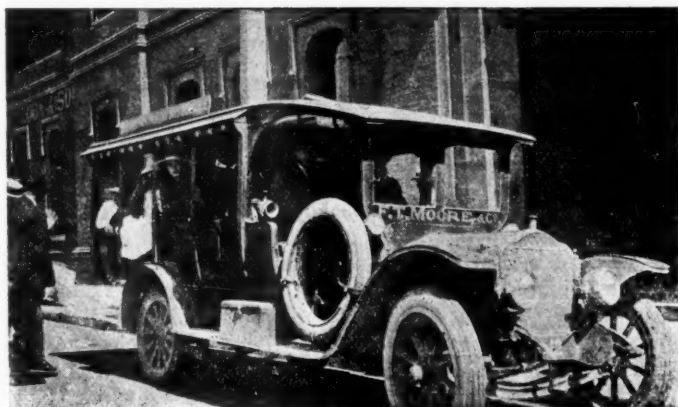
motor trucks are invariably sold on time ranging from 4 to 18 months. Twelve months represents a fair average of the time-payment period on trucks. It is up to the distributor not only to finance his dealers but also to carry the financial burden of time sales.

Death of Prof. Bertram Hopkinson

COLONEL BERTRAM HOPKINSON, better known to automotive engineers as Professor Hopkinson of Cambridge University, lost his life in an airplane accident some months ago. He was a son of Prof. John Hopkinson, who formulated the law of the magnetic circuit, and was educated at Kings College and Cambridge University. For five years after completing his education he was engaged in consulting engineering work, mainly on electric light and power installations. In 1903 he was appointed professor of engineering at Cambridge. At a somewhat later date he turned his attention to the study of gas engine phenomena and became a member of the committee on Gaseous Explosions, of the British Association for the Advancement of Science.

This committee has done much work in clearing up some of the mysteries connected with the phenomena of explosions in engine cylinders, and a great deal of credit for this work is due Professor Hopkinson. On ignition in a gas engine cylinder, the maximum pressure attained is only about one-half of the figure calculated from the supply of heat energy and the formerly accepted values of the specific heat of the products of combustion. An hypothesis long popular was that the discrepancy was due to dissociation, but the experiments of the committee proved this view to be untenable. Part of the discrepancy was traced to the fact that the specific heats of the products of combustion increase considerably with rising temperatures, but Hopkinson proved that much of the defect of pressure was to be ascribed to radiation phenomena. As the energy lost by radiation varies as the fourth power of the absolute temperature, the loss to the walls becomes very serious at the temperature of the explosion which may reach 2000 deg. C. Measurements made in Professor Hopkinson's laboratory showed this loss to be very large, and an explanation was thus afforded of the fact that in practice the use of extremely rich mixtures had been found unprofitable.

Dr. Hopkinson also helped to clear up another puzzle in gas-engine practice. In Sir Dugald Clerk's early experiments on the explosion of gaseous mixtures, which were made with the gas in a static condition in a closed vessel, an appreciable time was required to effect the explosion. This time was in fact in some cases greater than the total duration of the stroke in motor car engines. There is thus in practice a notable acceleration of the explosion which was traced by Dr. Clerk to the turbulence of the gases consequent on their entry into the cylinder at a high speed, and this view was confirmed by Professor Hopkinson, who found that with a 10 per cent mixture of coal gas and air in an explosion vessel the time of explosion could be accelerated by stirring up the mixture by means of a fan. Thus with the fan stationary, the time of the explosion was 0.13 sec., and this was reduced to 0.02 sec. when the fan was run at 4500 r.p.m.



There is a great deal of passenger service by bus outside of Wellington, Christchurch and Napier. These lines run 40 miles out



The F O R V M



Diesel and Similar Engines

By Harold B. Wilson

Engineer, Kwang Tung Electric Supply Co., Canton, China

I HAVE just received the War Number of AUTOMOTIVE INDUSTRIES. It was a banner number for the engineer in a far country who wants reliable information on war activities.

There was one point discussed at the S. A. E. meeting that I do not believe was given careful consideration, namely, the naughty air compressor on a Diesel engine.

In the early stages of Diesel development the air compressor did give no end of trouble. To concerns just starting in the Diesel building game the air compressor will probably give trouble, but the old builders have solved their difficulties with this piece of machinery. We have five different makes of compressors in our power plant and only one of them gives trouble. That one has a very poor mechanical design. Some of our compressors are ten years old, so there is no question as to their reliability and wearing qualities.

From the discussion before the S. A. E. one would get the impression that air injection was detrimental to combustion, power output and economy. Not one of those points is borne out by facts.

A common method of clearing up the exhaust in Diesel operation is by raising the pressure of the injection air.

All experiments with solid injection (that have come to my knowledge) have shown a loss of power per unit of piston displacement and a loss in economy.

Fuel Consumption Data

Makers of four cycle Diesel engines guarantee a fuel consumption of not over 0.45 lb. per b.h.p. at full load and not over 0.5 lb. per b.h.p. at half load. For small two cycle engines these figures are 0.5 to 0.6 lb. respectively. The thermal efficiency of the average engine in operation is 38 per cent as compared with the 30 per cent of the Hvid engine on a special test.

Compare the Hvid engine discussed before the S. A. E. with the Wisconsin Junkers 60-hp. marine engine. The latter has two cylinders 6 x 14 in. and operates at 400 r.p.m., each piston having a 7 in. stroke. The Wisconsin engine is rated at 3.06 ft.³ per horsepower, giving a mean useful pressure of 75 lb. per in.² In practice it will probably do better.

The Hvid engine 5 1/4 x 9 in. developed 7 1/4 hp. at 300 r.p.m. on a special test. That figures out to 3.56 ft.³ piston displacement or about 64.5 lb. per in.² mean useful pressure. Place the fuel consumption of the Wisconsin engine at 0.5 lb. per b.h.p. and show where solid injection has produced more power and better combustion.

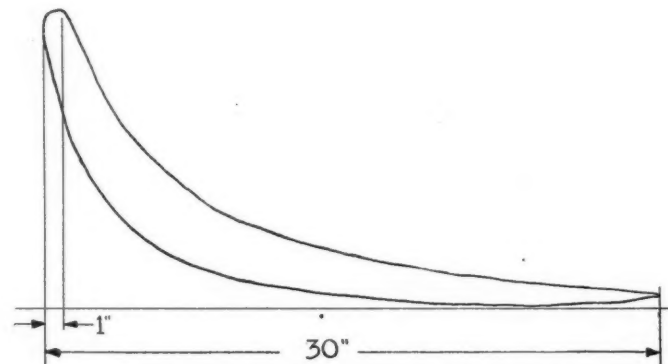
Air injection does cause a slight refrigeration, but it is so slight as to be negligible. A glance at an indicator card will show that. The Diesel is the only combustion engine that gives a card approaching the ideal steam engine card. The injection air is so well mixed with the finely pulverized fuel that combustion takes place instantly. The fuel is burned just as it enters the combustion chamber, causing an even expansion instead of the explosion that takes place in other types of combustion engines.

I wish to submit a card taken from one of the engines in our station. You will note that the fuel has been burning as steadily as the flame of a blow torch during 22.5 deg. of the 27 deg. total opening of the fuel valve. That allows just 2.5 deg. for the opening and 2.5 deg. for the closing of the fuel valve. This steady complete burning of the fuel as it enters the combustion chamber accounts for the high economy of the Diesel. This high economy is not an occasional feature, under special conditions, but a reliable every day feature.

In gas, gasoline or surface ignition oil engines the ignition is started at from 17 deg. to 25 deg. and even 30 deg. before top center. The combustion begins with a slow burning and

ends in an explosion, causing a great rise in pressure. The Hvid approaches the Diesel cycle more nearly than the others, as the fuel is blown through small holes, by high pressure gas, in a more or less steady stream. Its lack of economy is probably due to the fact that the fuel is not so finely pulverized and is not mixed with air when it enters the cylinder.

Now for varying the speed of a Diesel engine. This can be done by varying the lift of the fuel valve with the fuel pump, without greatly injuring combustion. Marine engines must have variable speeds, and this feature has already been worked out.



Indicator diagram from Diesel engine

Data of machine from which card was taken: Three cylinders, 21 in. bore, 30 in. stroke. Speed, 180 r.p.m. Spring, 400 lb. p. in. Fuel valve opens 2.5 deg. b.t.c., closes 25 deg. a.t.c. Total opening, 27.5 deg.; ϕ , 22.5 deg. Load, 500 hp. M.e.p. 84 lb. p. sq. in. M.u.p. 70.7 lb. p. sq. in. Pounds fuel per b.h.p. 0.42. Fuel B.t.u. p. lb. 18,984

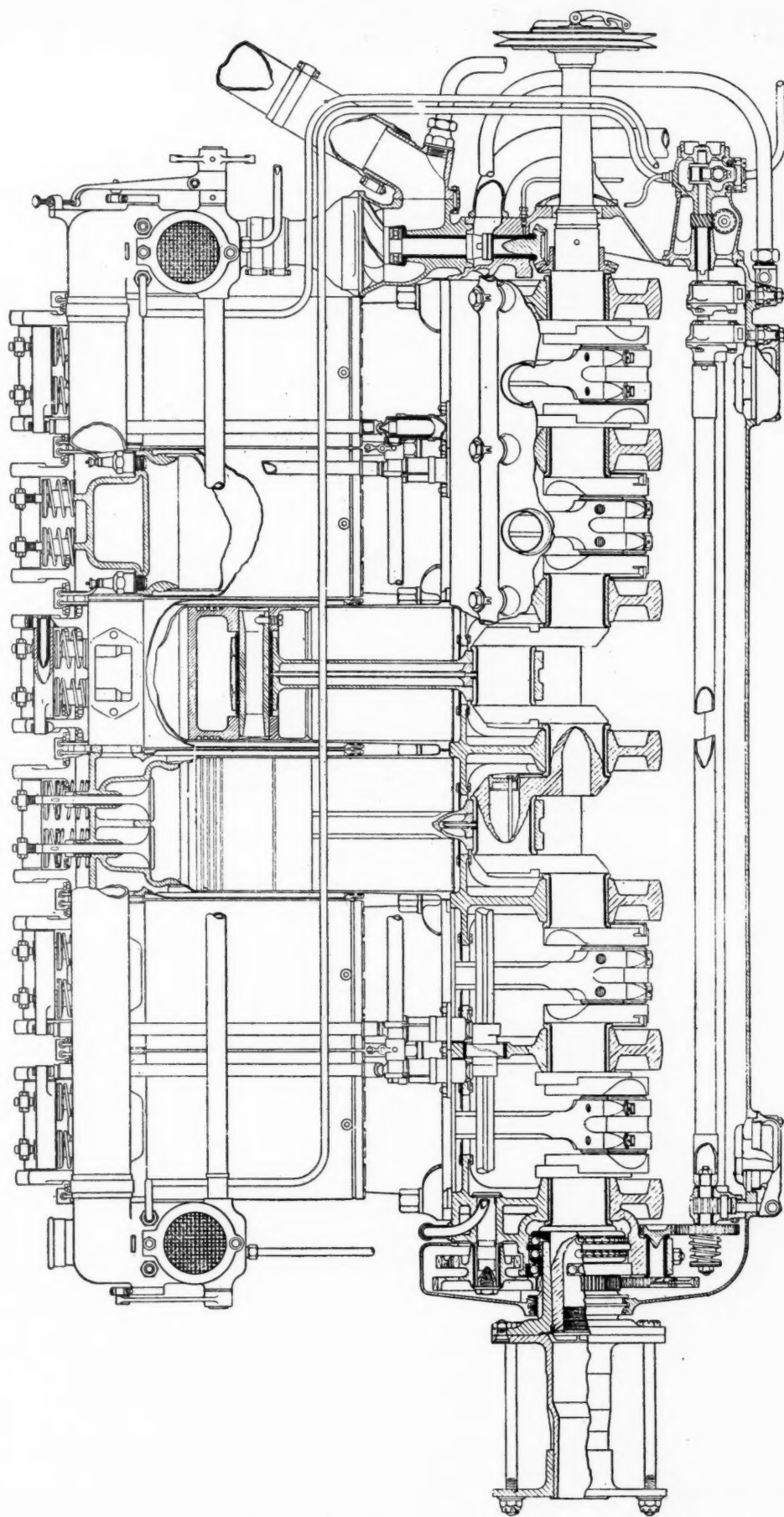
Understand me, I am not knocking the Hvid engine. It is a wonderful little machine. Its test records show up much better than the oldest of its rivals, the surface ignition engine. It is certainly much simpler than any other combustion engine on the market. Diesel engines are too complicated and expensive to ever seriously compete with it in small sizes. The Hvid will hardly compete in sizes from 200 hp. up, the main field of the Diesel.

I'm wondering just why nobody builds a two cycle Hvid. If it is to be a factor in the automotive field the two cycle engine looks more promising than the four. It would weigh just a little more than half as much per horsepower and should give nearly as good economy. The two cycle should throttle better than the four cycle engine on account of the greater number of power strokes. The chief trouble in throttling a two cycle gasoline engine does not occur in injection engines. There is no carbureter and its attendant trouble making mixture.

Improvement in Liquid Metal Spraying

IN a new adaptation of the Schoop liquid metal spraying process the metal stock used, instead of being melted by the oxy-hydrogen flame, is fused electrically, which is said to be both cheaper and better. The pistol apparatus is employed as before; but two ends of the wire are placed in the pistol, instead of one, and they are approached to one another as electrodes of an electric circuit. When the arc strikes, the wire fuses, and the six current tears the fine metallic particles away. Ziac sprays in particular have been produced in this way. The electric heating may be simple, but the prevention of the oxidation of the sprayed metal will probably be as difficult as before.

Maybach 300-Hp. Six-Cylinder Aircraft Engine



Principal Specifications

Cylinder Dimensions, 165 x 180 mm.
Normal speed, 1500 r.p.m.
Brake m.e.p., 117.7 lb. at 1400 r.p.m.
Max. brake m.e.p., 120.5 lb. at 1200 r.p.m.
Compression ratio 5.95:1.
Crankshaft diameter, 66 mm.

Valve clear diameter, 48 mm.
Total weight of engine, 911 lb.
Weight per horsepower, 3 lb.
Piston speed, 1654 ft. per min. at 1400 r.p.m.
Mechanical efficiency (calculated) 86 per cent.
Brake thermal efficiency, 28.9 per cent.

The 300-Hp. Maybach Aircraft Engine

Technical Description of the Largest German Aircraft Engine Model, Issued by the Technical Department of the British Air Ministry



Fig. 2—Cylinder and head

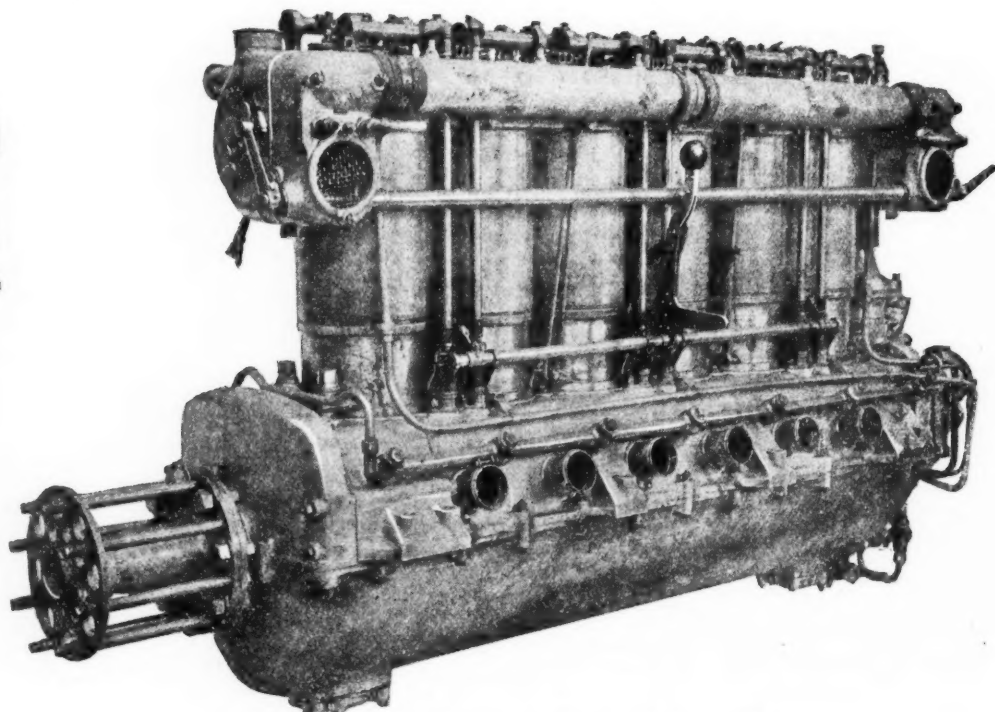


Fig. 3—Right hand side of Maybach 300-hp. engine

THE general distinctive features of the design of the Maybach aero engines are as well known among aeronautical engineers in Great Britain as any of the enemy aero engines in service; firstly, by reason of the adoption of the old Wolsley-Maybach aero engines, the design of which was acquired before the war for airship work, and which was based on the design of the original Maybach engine; and, secondly, through the publication of the somewhat incomplete details of construction of the Zeppelin-Maybach engines and their installation, which were collected under great difficulties from the remains of the several Zeppelin airships brought down during the war.

These engines, in almost every case, were so badly damaged by fire that it was found almost impossible at the time to compile any really detailed report of their design, or of their power and general performance.

A new and more powerful type of Maybach engine is now being used in service by the enemy, which, according to French reports, develops over 300 hp., and which possesses great efficiency.

During the past few months several of the latest type of Rumpler machines have been captured fitted with the new 300-hp. Maybach engines.

The following report on the design of the 260-300 hp. Maybach engines is based on a detailed examination of engine No. 1261, taken from a Rumpler two-seater biplane (G.120), known as the C.4 type. This machine was brought down in France on Jan. 18, 1918, by a shot which perforated the carburetor and water pump. The machine was, unfortunately, completely destroyed by fire on landing, but the

engine was captured intact and little damaged. After slight repairs this engine has been put into running condition and tested for power, consumption, etc., at R. A. E. The results of these tests are given in the following report, together with metallurgical analysis and mechanical tests of materials and alloys used in the principal parts of the engine.

A complete list of the details of the design is given in the various data at the end of this report, including the percentages of weights of all parts, and the results of separate tests carried out on the carburetor and a new design of gasoline pump which is used in conjunction with the interesting high-altitude carburetors.

A brief description of the Rumpler C.4 and 5 type aeroplane in which these new 300-hp. Maybach engines are fitted will, no doubt, be of some interest here. Full details of this machine, however, have already been issued in a published report by the *Section Technique de l'Aeronautique Militaire*.

The Rumpler C.4 machine is a two-seater biplane, corresponding, more or less, to the D.H.4, and is generally fitted with a 260-hp. Mercedes engine. These machines are designed for long-range artillery reconnaissance and photography, and are armed with two guns—one Spandau fixed in front of the pilot's seat, firing through the propeller, and a swivelling gun mounted in the observer's seat behind. A two-bladed air screw is fitted, and a semicircular honeycomb radiator of unusual design is slung above the engine from the center section.

These machines are generally flown, according to report, at high altitudes—i.e., from 15,000 to 17,000 ft.—until over the lines, and from the French reports, the new 300-hp. May-

bach engines are more flexible and regular in running than the 260-hp. Mercedes engines, and are generally preferred by the German pilots.

Compared with the 260-hp. Mercedes engines fitted in these machines, the new Maybach engines are credited with attaining an increase of 200 r.p.m. at altitudes above 2000 ft., and also possess greater efficiency in speed and climb in the Rumpler biplanes.

The total weight of the machine fully loaded is approximately 3439 lb.

General Features

The 300-hp. Maybach presents several unusual and interesting details, and as compared with the old 240-hp. Zeppelin-Maybach design, the new engines are undoubtedly a great improvement. The quality of the workmanship of every part, including the exterior finish throughout, is exceptionally good, and the working clearances are carried to very fine limits. Compared with any of the types of enemy engines, the workmanship is undoubtedly of a very much more finished nature; every part, nevertheless, shows the usual German characteristics of strength and reliability, combined with standardization of parts and ease of manufacturing, in preference to the saving of weight.

The general lay-out of this engine follows the usual German six-cylinder vertical type. The compression ratio is exceptionally high, viz., 5.94:1, which necessitates the use of very heavy pistons and connecting rods. In these particulars this engine follows the previous Maybach practice, but the adoption of a cast-iron floating bush in the little end bearing is an interesting development.

Four overhead valves per cylinder are fitted, i.e., two inlet and two exhaust. These are operated by rocker levers mounted on roller bearings in brackets fixed to the cylinder heads, as shown in Fig. 2, and by push rods on each side of the cylinders actuated by separate inlet and exhaust cam-shafts.

The camshafts run in plain bronze bearings in the crank-chamber, and lubrication is by splash.

Little alteration has been made in the design of the massive crankshaft, which runs on plain white-metal lined bearings throughout, and is provided with the well-known Maybach type centrifugal pressure lubrication system to the crank-pins, thence to the piston pins through small pipes inside the hollow connecting-rods.

The three separate and detachable gear oil pumps, which are situated in the bottom of the base chamber, are of new design.

The pump driving shaft at the front end is driven through a ratchet gear on the front scavenger pump, apparently with the object of preventing an air lock in the lubrication system in the event of back-firing.

A double-acting, oil-sealed gasoline pump of unusual design is now fitted. This is driven off an extension of the main oil pump spindle at the rear end of the base chamber, and works, of course, in conjunction with the two separate carbureters. These are of the well-known Maybach type, and have been only slightly modified. As shown in Fig. 3, they are attached, as in the Zeppelin engines, to the front and rear cylinder water jackets. A full description of the functions and workings of this interesting type of carbureter is given toward the end of this report.

The well-known Maybach induction type starting gear is fitted, but is slightly modified in design.

The whole of the induction system and the oil condensing crankcase ventilating system is an interesting point in the design of this engine, as is also the method of attaching the propeller-hub driving flange on the tapered front end of the crankshaft.

Practically no alteration has been made to the general design of the very simple and efficient type of water pump, which delivers directly into the bottom of the rear end carbureter water jacket as in the old Maybach engines. Ignition is by two Z.H.6 type Bosch magnetos, which are driven

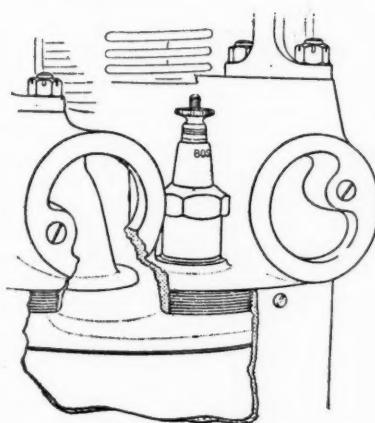


Fig. 4—Showing water jacketing of valves

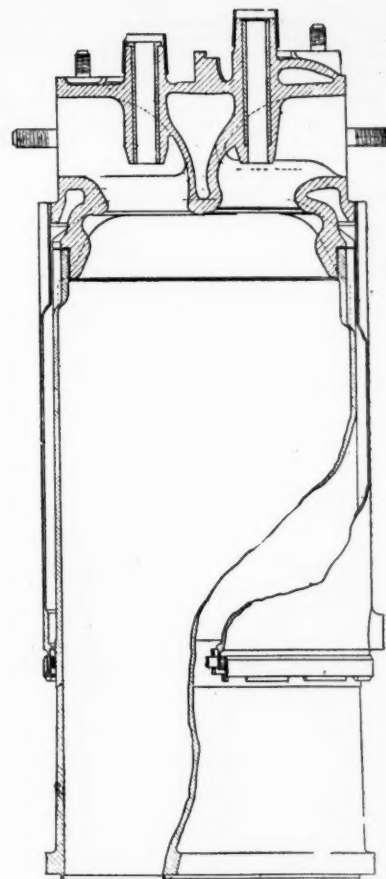
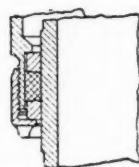
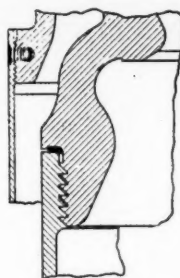


Fig. 5 (above on left)—Detail of jacket joint

Fig. 6—Maybach cylinder and head, in section

directly off the rear ends of the camshafts; the position of the spark plugs in the cylinder heads is a point of interest dealt with in detail in the following description.

Cylinders.—In comparison with the Zeppelin-Maybach engines, the cylinders of the new 300-hp. Maybach engines are of very much lighter construction; and, as will be seen from the sectional drawings, are of a wonderfully clean design. Each cylinder shows practically a rectangular view from almost any point of view, with no excrescences or extensions. The whole construction of the cylinders, and particularly the formation of the cylinder head, presents many interesting details of design.

Referring to the sectional drawing, Fig. 6, it will be seen that each cylinder is built up of a thin steel barrel, machined and ground to 165 mm. bore, and machined on its outer surface to a thickness of 3 mm. The thickness is increased from 3 mm. at the bottom of the water jacket to 4.5 mm. at the cylinder base flange. Into the top of the cylinder barrel is screwed the cylinder head, which is of cast iron. A detailed sketch of this screwed joint is shown in Fig. 5. The screw thread, it will be noted, is 2.3 mm. pitch, buttress thread. A soft brass washer is fitted at this joint between the cylinder head and the top face of the threaded portion of the cylinder barrel.

The bottom of the cylinder barrel extends only 3.5 mm. below the base flange into the registering joint of the crankcase, and the bore of the cylinder is very little chamfered.

The design of the cylinder heads and the formation of the water passages round the twin inlet and exhaust valves is unusual, and the double inlet and outlet water connections between each pair of cylinders are of new design. The formation of these twin water connections is clearly shown in the detail sketch of the cylinder head (Fig. 4), together with the water passages cast round the spark plug bosses; the latter are somewhat inaccessibly situated in the space between the two cylinder head water joints. The two semicircular

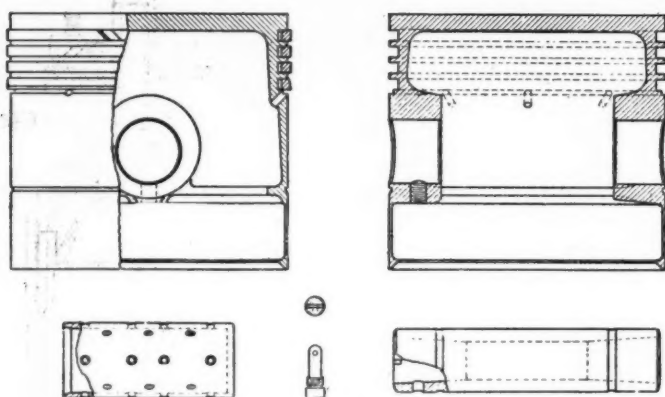


Fig. 7—Piston and piston pin

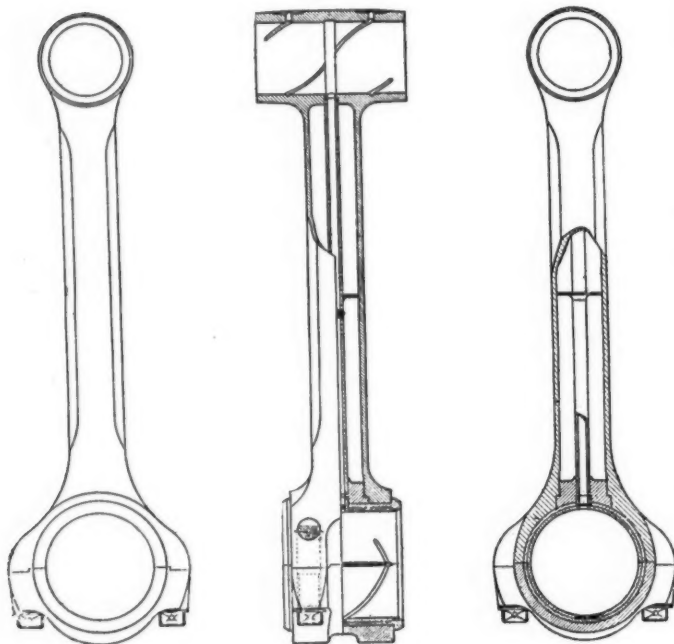


Fig. 8—Connecting-rod

bosses which are cast on the sides of the cylinder water joints are provided for the attachment of the two carbureters, which are fixed to the front and rear cylinders by long studs screwed into these bosses in the water joints. To allow for the interchangeability of the cylinders, these holes are drilled in every cylinder; when the cylinder is not assembled at the front or rear, they are plugged with brass grub screws as shown in the sketch.

An interesting point of design in these cylinders lies in the fact that no water connections between the cylinders are made other than the twin head-joints referred to. (This principle is similar to that used in the cylinders of the Zeppelin-Maybach engines; these were provided with one large water joint, 5 in. in diameter, between each pair of water jackets, which was an extension of the cast-iron head. The cylinder barrels were also of cast iron, and were fitted with two inlet and three exhaust valves per cylinder.)

The exhaust valve pockets are provided with an additional water passage above the exhaust port, and cast so as to give a free water space completely round the center portion of each exhaust valve-stem guide.

The valve guides cast in the cylinder heads are fitted with cast-iron bushes pressed into position. The exhaust bushes do not extend the full length of the guides as the inlet does, but are kept back a distance of 10 mm. from the bottom of the guide, so that they are protected from the hot gases. As a further precaution against seizing, the diameter of the bottom of the exhaust bush is slightly reduced so that the bush has room to expand.

Contrary to the usual German practice of building up the

water jackets of sheet steel acetylene-welded at the joints, the water jackets are machined from cylindrical steel forgings, which, as shown in Fig. 5, are screwed on to the flange machined on on the cylinder head; the pitch of this thread is 1 mm. This threaded joint is finally sweated in position with soft solder, the whole depth of the threaded portion having apparently been previously tinned; the joint is locked with four 6 mm. grub screws.

The whole of the water jacket is machined both on the inside and also on the outer surface to a thickness of 1 mm. The water jackets extend to 104 mm. from the base of the cylinders, or roughly to two-thirds of the total length of the cylinder barrels; but, as will be noted, the water space is exceptionally narrow—i. e., 7 mm.

The only water passages from the cylinder head to the annular water space of the water jackets are through the openings or passages cast in the cylinder heads encircling the spark plug bosses, and situated directly below the twin water connections. The formation of these water passages leading from the head of the jacket is made clear in the perspective sketch (Fig. 4).

The water jacket capacity of one cylinder = 1284 C.C.S.

Fig. 5 shows an enlarged view of the lower joint between the cylinder barrel and the water jacket. This joint consists of a soft rubber composition packing ring, compressed in position between two steel rings by a large ring which screws on to the bottom of the water jacket by a fine pitch thread in the manner shown in the sketch. This joint is, to a certain extent, flexible, and allows for the relative expansion between the cylinder barrel and the water jacket.

Small drain plugs are provided at the bottom of each cylinder water jacket; these are screwed into bosses welded into the water jackets on the exhaust side. The combustion chamber is circular, but it is slightly recessed below all of the four valve seats, which are all of the same diameter, i. e., 54 mm.

The area of both the inlet and exhaust ports is 30.15 sq. cm. = 4.66 sq. in.

The clearance volume of one cylinder = 778.9 cub. cm. = 47.54 cub. in., giving a compression ratio of 5.94:1.

Short pieces of aluminum tube are fitted over the top ends of the lugs in the cylinder heads forming the valve stem guides. These are shown in Fig. 6, and are apparently provided for lubrication purposes. Thin sheet steel plates are bolted to the inlet and exhaust ports of the cylinder heads to stiffen up the engine.

Pistons—Very little alteration has been made to the general design of the piston in comparison with the smaller Maybach engines. The pistons are of cast-iron, and weigh 12.3 lb. each, complete with rings. Four rings are fitted, all above the piston pin, the lower one being a scraper ring. All the rings are concentric, and are 6.5 mm. wide (vertically) and 5.5 mm. deep, the depth of the ring grooves being 6 mm.

The pistons, as will be seen in Fig. 7, are quite flat on both the top and bottom surfaces of the crown, which is 10.5 mm. in thickness. Eight 4 mm. return oil holes are drilled through the piston below the scraper ring in the usual way.

The rings are cut diagonally at 45 deg., no locating pegs being fitted; and the width of the ring gap in the cylinder is 1.39 mm. = 0.055 in.

All the piston rings are machine-hammered on their inner surfaces. This process, which is now extensively used, and is well known, consists of subjecting the inside face of the ring to a series of mechanical hammer blows at gradually increasing distances apart. The process shows a large number of small transverse depressions, extending nearly the width of the ring on the inner surface. These depressions caused by the hammer are approximately 1 mm. apart at the back portion of the ring, i. e., the part of the ring farthest from the gap—and increase in mathematical progression to about 4 mm. apart toward the front of the ring up to about 1 in., on either side of the gap. This mechanical hammering of the inside ring has the effect of giving the desired uniform pressure to the concentric ring against the cylinder wall.

The holes for the piston pin are bored eccentrically in the piston pin bosses, giving a thickness of metal of 14 mm. above and 9 mm. below the piston pin. An oil groove is cut in the piston skirt below the piston pin, evidently to assist

the scraper ring and the piston lubrication. The inside of the skirt is machined up as far as the bottom of the piston pin bosses, and a beveled lip is turned on the bottom flange of the skirt. The inside of the piston is also machined flat across the head, and down as far as the top of the piston pin bosses with 15 mm. radius; an annular rib is cast on the inside of the skirt to reinforce the piston bosses.

Other details of the design of the pistons are given in the section drawing Fig. 7.

Piston Pins—The piston pins are 159 mm. long, slightly beveled at the end, and are fixed in position in the piston by a single cheese-headed 9 mm. set screw in the usual way and locked with a split pin.

The piston pins are hardened and ground to three parallel outer diameters, being made of smaller diameter at one end than the other. The center portion which makes the small end bearings is 38 mm. diameter, and the two ends which fit into the piston pin bosses are 37.5 and 38.25 mm. diameter respectively.

The piston pins are bored 23 mm. diameter in the center, tapering to 28 mm. at each end.

Floating small end bushes are now fitted to the piston pin in the connecting-rod smaller ends. These floating bushes are made of cast iron of a very soft nature. The effective bearing length of the floating bushes is 93 mm., and their external diameter is 44.3 mm. For lubrication purposes a number of 4 mm. holes are drilled and countersunk on the outside.

The projected area of the small end bearing surface on the piston pin = 35.35 sq. cm., and the bearing surface in the connecting-rod small end = 39.9 sq. cm.

The weight of each piston pin = 1.75 lb., while the cast-iron floating bushes weigh 0.62 lb. each.

Details of the piston pins and the floating connecting-rod small end bushes are given in Fig. 7.

Connecting-Rods—Following the usual Maybach design, the connecting-rods are of square section beveled at the four cor-

ners, and bored up the center from the big end with a 28 mm. diameter hole, which is threaded and plugged, as shown in Fig. 8.

The big end bearing cap is secured by four 14 mm. bolts, which are threaded 1.5 mm. pitch into the top half of the connecting-rod big ends.

The inner surface of the big end bearing shells are machined with a screw-cutting tool which leaves a fine pitch screw thread.

No lock nuts are fitted to the big end bolts, but the square heads of the bolts are drilled, and prevented from becoming unscrewed when in position by a 4 mm. diameter pin, which is long enough to pass through the heads of each pair of bolts.

Two helical grooves 2 mm. wide are cut in the big end bearings. These oil grooves intersect each other on the center of the bottom half of the bearing, as shown in Fig. 8; the oil ways cut in the top half of the big end bearing metal are only taken half way on each side.

The little end floating bushes already referred to are lubricated by a 5 mm. steel pipe, which is fixed in the center of the hollow connecting-rods, and the holes drilled in the floating bushes communicate with helical grooves cut in the small end. An annular groove is cut round the center of the small end bearing, which communicates with the central oil pipe. The method of securing this oil pipe at each end inside the rod, and the steel disk, which supports the center of the oil pipe in the bore, are shown in the sectional drawing.

The total side clearance of the big end bearing between the sides of the crankwebs = 0.44 mm. and the float of the small end = 11.8 mm.

Total weight of the connecting-rod complete with floating bush = 8.93 lb.

Weight of big end = 5.625 lb.

Weight of little end = 3.305 lb.

Length of connecting-rod between centers = 310 mm.

(To be continued)

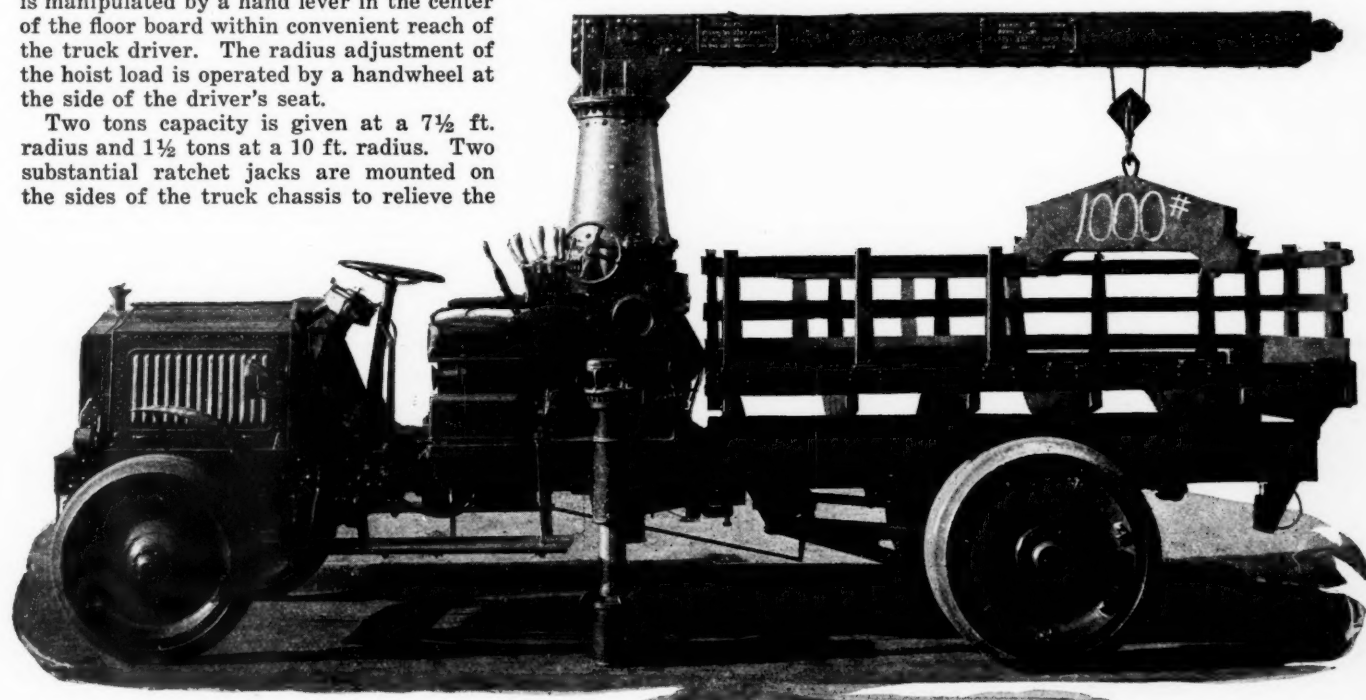
Crane Hoist on Motor Truck

A NOVEL crane hoist, one of the first of its type to be mounted on a motor truck, has just been delivered to the U. S. Marine Corps by the Packard Motor Car Co.

The apparatus consists of a 10 ft. boom mounted upon a hollow steel mast. The hoist and slew, either to right or left, are operated from the Packard standard power take-off. This is manipulated by a hand lever in the center of the floor board within convenient reach of the truck driver. The radius adjustment of the hoist load is operated by a handwheel at the side of the driver's seat.

Two tons capacity is given at a 7½ ft. radius and 1½ tons at a 10 ft. radius. Two substantial ratchet jacks are mounted on the sides of the truck chassis to relieve the

frame from strains while the crane is in use. The truck in the illustration is a Packard standard 5-ton chassis, with 9 ft. 5 in. stake body and steel disk wheels, the entire outfit being painted the olive-drab of the Marine Corps. Two more Packards of 6-ton capacity each have been ordered by the Marine Corps, to be equipped with similar crane hoists.



Twin Disk Clutch and Clutch Pulley

Specially Designed Tractor Components to Be Manufactured
in Racine, Wis.—Features of the Clutch Are Its
Floating Disks and Ease of Adjustment

AN interesting design of clutch specially adapted for tractor service is the Twin Disk. A sectional view and a rear view of the clutch are shown herewith. The clutch comprises one driving disk, which may be driven by means of four driving pins pressed into the flywheel web, and two driven disks, of which one is keyed to a clutch sleeve. Between the driving disk and the two driven disks there are disks of asbestos fabric, which latter are not fastened to any of the metal disks, but float between them. The driving torque taken by the

rearward driven disk is transmitted to the forward disk by means of four inner driving pins, pressed into the driven disk that is keyed to a clutch sleeve.

In drill holes of this latter disk midway between the inner driving pins are located four coiled springs which press the disks apart immediately the clutch is released. The various disks are pressed together for engaging the clutch by means of four clutch fingers which are pivoted on a four armed spider, screwed over the clutch sleeve. The clutch fingers are deeply carbonized and hardened, and they act against a hardened steel ring set into one of the driven disks. The clutch is engaged by pressing a steel cone between the ends of the clutch fingers.

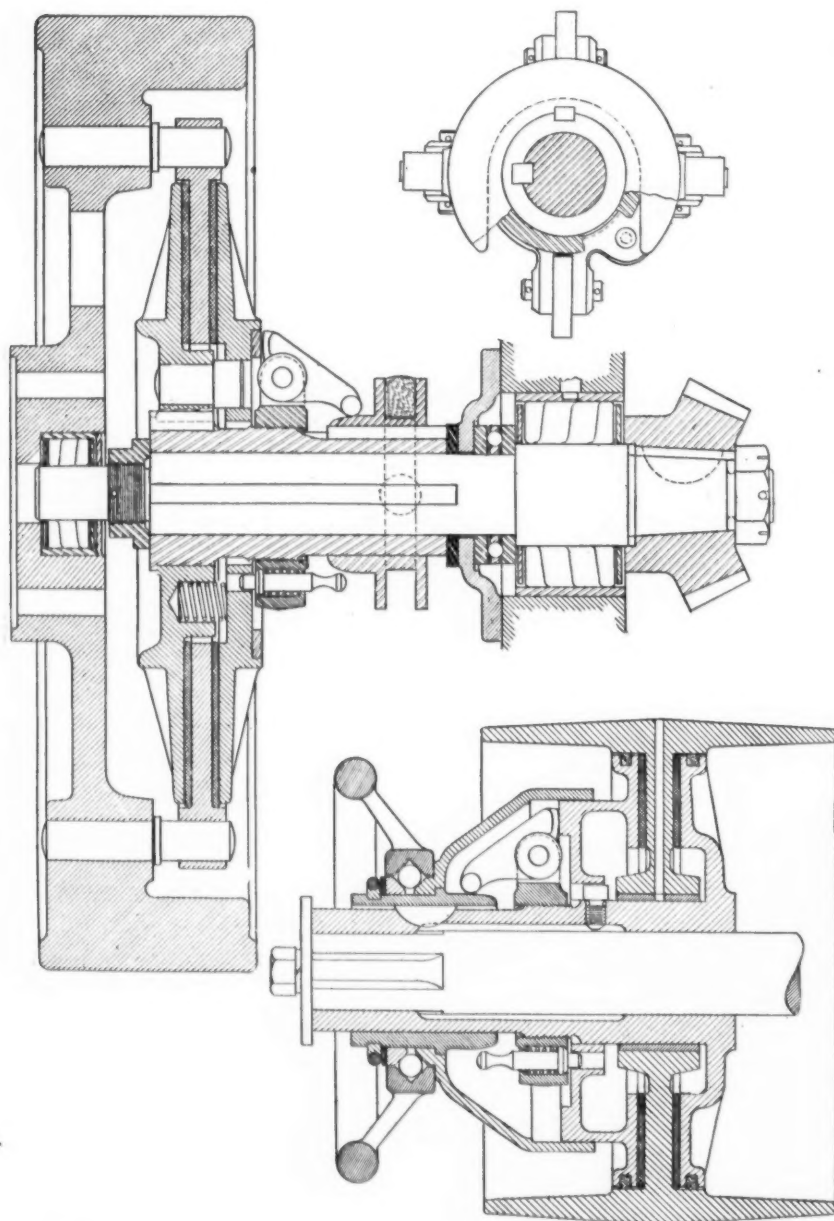
A feature of the clutch is the ease with which adjustments can be made. This is accomplished by turning the four-armed spider on the clutch sleeve, after the spring-retained locking pin has been withdrawn. There is a circle of twelve equally spaced holes in the rearward driven disk for this locking pin, and very fine adjustments are therefore possible. These adjustments can be made without the use of tools, and even while the engine is running, though the latter procedure is not recommended.

This clutch can be secured to the flywheel without the use of cap screws; in fact no screws are used in the whole clutch, except when the latter is used in connection with a standard S. A. E. ring. In that case eight screws are used, to fit the regular tapped holes, and these screws hold the regular S. A. E. ring with the driving pins pressed into it. It is claimed for the clutch that it absolutely does not jerk, and that it has great pulling power. In substantiation of this latter claim it is stated that when mounted on a Wallis tractor, a three-bottom plow set to plow 8 in. deep could be started with the clutch pressed in with the little finger.

The illustrations show a typical mounting, the flywheel, driving pinion and bearings being, of course, no part of the clutch.

In addition to the clutch the Twin Disk Clutch Co. manufactures a clutch-pulley for tractors; that is to say, a combination belt pulley and friction clutch. In the majority of tractors the power for the belt drive is transmitted and controlled through the regular friction clutch which also controls the power to the driving wheels; but a few tractors, notably the Moline Universal, do not take the belt power through the regular clutch. It will be seen from the sectional view herewith that the clutch used in connection with the pulley is of the same type as that described above. The clutch is engaged by means of a steel cone, which is operated by a hand wheel containing a ball bearing, so that the operator may retain his grip of it whether the clutch is engaged or not. The same adjusting means is provided as on the larger diameter clutch. In

(Continued on page 780)



Sectional view and partial rear view of Twin Disk tractor clutch.

Sectional view of Twin Disk clutch pulley

What Langley Did for the Science of Aviation

Later Experiments with Quarter-Size and Man-Carrying Aerodromes Were But Partially Successful—No Sustained Flights Were Accomplished

PART III

LANGLEY felt, when he had finished his work with models and had demonstrated the possibility of mechanical flight, that his work in the field was ended. He was tempted to proceed and to enlarge his efforts with a view to the construction of a man-carrying machine, but after careful consideration he decided not to do so. His original object had been to take up the subject of flight academically, to demonstrate that it was possible, and to determine and formulate the principles governing its accomplishment.

However, the natural desire to go on, coupled with the influence of pressure brought to bear upon him by some of those close to him, and more particularly by the Board of Ordnance of the United States Army, eventually induced him to undertake the construction of a machine capable of carrying a man. President McKinley was impressed with the possibilities of the flying machine as a military aid, and he, too, urged Dr. Langley to continue. He appointed a joint board of army and navy officers for the purpose of investigating and reporting on the plans which Dr. Langley had employed in obtaining flights with his models. This board returned a favorable report to the Board of Ordnance and Fortifications of the War Department, and Langley was formally requested to undertake the building and testing of a large machine, from which it was hoped to learn enough so

that a practical machine of military value might subsequently be constructed.

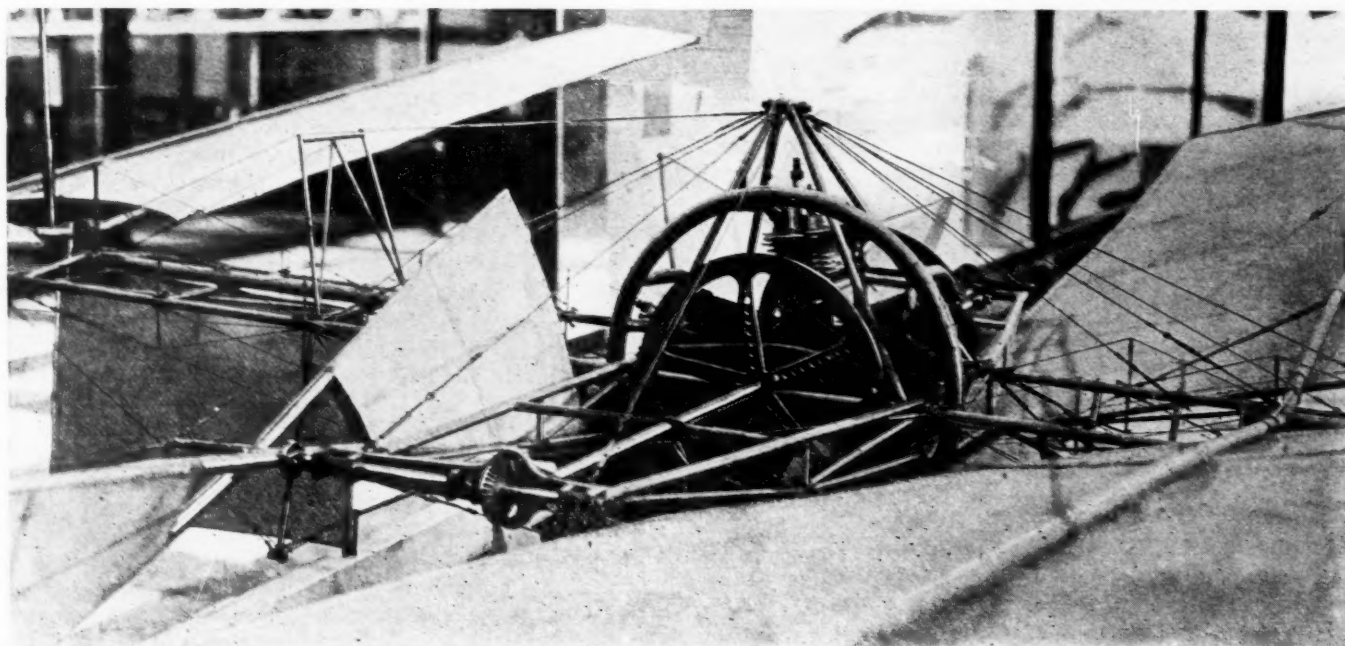
Even in the construction of small models, the matter of providing power plants which would generate sufficient power and not be of excessive weight had presented difficulties which were not easily surmounted. But Langley was able to overcome these difficulties by means which he clearly saw could not be employed on a larger scale to provide the necessary amount of power to drive the large plane contemplated.

It was also realized that there was small likelihood of finding the solution of the problem in any sort of a steam plant, and Langley was therefore forced to turn to the internal combustion engine, with which he had very little experience.

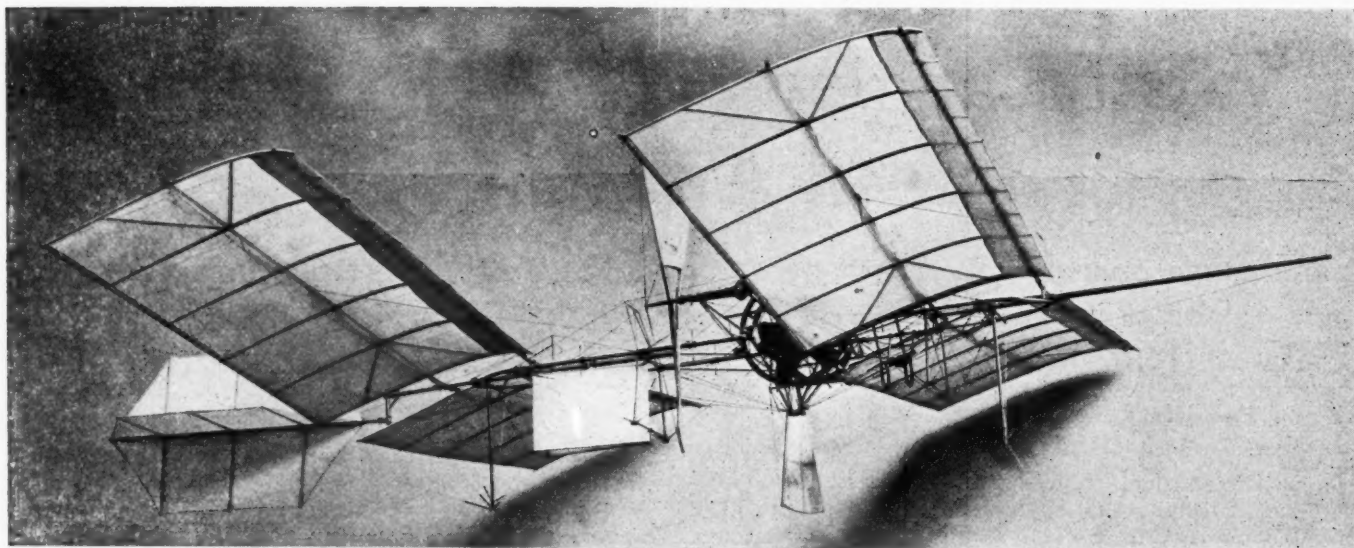
It was decided that a 12-hp. engine, which should weigh not exceeding 100 lb., was what should be obtained, and a contract was entered into with S. M. Balzer of New York in December, 1898, to build such an engine.

Langley did not feel that this would be of sufficient power to actually attain flight with a man-carrying machine, but he hoped with it to obtain results sufficient to furnish him with necessary data on such points as balancing and the best method of construction for a launching device.

In arriving at the size of the man-carrying machine,



Engine used with the quarter-size model aerodrome. Cylinders were machined with integral radiating ribs, but, unfortunately, overheating continued



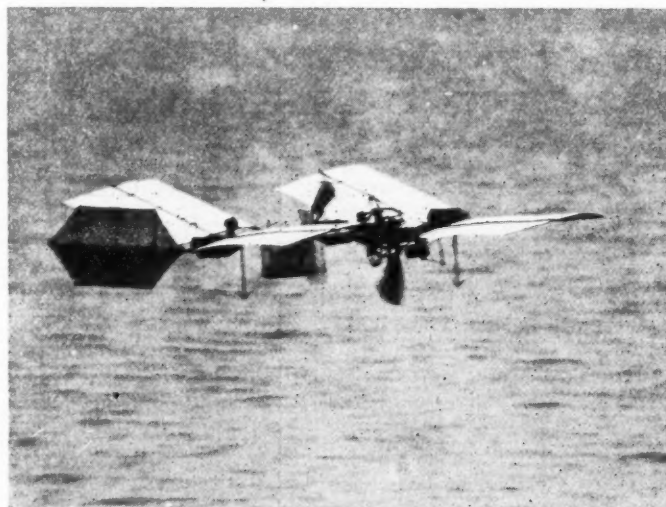
Three-quarter elevation of quarter-size model aerodrome. This is the type with "single-tier" wing surfaces which proved efficient but were not sufficiently strong

the assumption was made that models Nos. 5 and 6, which, it will be recalled, were the most successful of the large number of models which Langley constructed, were capable "of transporting a load of approximately 10 lb. more than their weight." And, "since the supporting surface of any aerodrome," to quote from the Langley Memoir, "would increase approximately as the square of the linear dimensions, in order to carry a man the aerodrome would need to be approximately four times the linear dimensions of these models. Calculations based on the results accomplished in the construction of the models, indicated that such an aerodrome would need to be equipped with engines developing 24 hp. The best that could reasonably be hoped for was that these engines would not weigh over 200 lb., and, therefore, allowing 40 lb. for fuel and the fuel tanks, it becomes necessary to bring the weight of frame, supporting surfaces, tail, rudder, propellers and other accessories within 250 lb., if the total weight of the machine, including 150 lb. for the aeronaut, was not in excess of 640 lb., or 16 times the combined weight of the model and its load of 10 lb. Although the problem of constructing the frames, wings and other parts within the limit of 250 lb. seemed indeed formidable, it was believed that the greatest obstacle in the production of such a machine would be that of securing a sufficiently light and powerful engine at the period.

The work of constructing the frame and wings proceeded almost to completion before the engine was delivered. The contract called for the completion of the engine on Feb. 28, 1889, but after that date, and even into May of 1900, the builder was forced to make a continuous series of changes in it. He experienced almost endless trouble in getting it to function properly.

The engine was of the rotary cylinder type. Tests made by Charles M. Manly or Dr. Langley in New York, in the shop of the builders in May of 1900, disclosed the fact that it would develop only 2.83 hp. and that even this output could not be maintained for more than a few minutes. Later changes increased the output to 4 hp., but it became apparent that no better results were to be obtained, and that there was no hope of using this engine in the experiments with the man-carrying plane.

When the construction of the frame and wings had reached the point where it became necessary to have the engine on hand, and the completion of the engine was not yet in sight, Langley decided that it would be best



Quarter-size model aerodrome in actual flight, August 8, 1903

to construct a model on the exact lines laid down for the large machines, but of $\frac{1}{4}$ size. With this model he hoped to obtain data regarding the relative positions of the center of pressure, center of gravity and line of thrust, to be used in checking the conclusions arrived at theoretically. It was also hoped that this quarter-sized model could be constructed and tested out without interfering with the progress of the construction of the large machine. It was decided to have an engine of about $1\frac{1}{2}$ hp. constructed on lines exactly similar to those of the larger engine which was then being constructed.

Further difficulties in securing successful operation of the larger engine finally persuaded Langley not only to have both the large and the small engine built in the shops of the Smithsonian Institution, but also to lay aside work on the large machine temporarily until the quarter-sized model could be completed and tried out.

The difficulty in obtaining exact information and worthwhile outside assistance from those who knew more of the science than he did, were encountered by Langley when he attempted the construction of the gasoline engine as had previously been encountered in working out the steam power plants for the small models.

Charles M. Manly, who was then with Langley and in charge of the experimental work, in writing of the difficulties encountered, said:

"At the time that this engine was being developed, it was practically impossible to obtain any outside information regarding the proper way of constructing it. The little that was then known had been learned through laborious experience, and at great cost, by the experimenters who were attempting to build automobiles, and was zealously guarded in the hope of preventing their rivals from utilizing the results of their labor. It was the known custom, however, of all engine builders at this time to use a separate spark coil and a separate contact maker for each cylinder of an engine, no matter how many cylinders there were.

"This multiplication of spark coils, which at that time were very heavy, not only added greatly to the weight but also had the same defect that the wipe-spark type of sparking arrangement had of being exceedingly difficult to so adjust that all of the contact makers would perform their functions at exactly the same point in the cycle for each cylinder."

To obviate these difficulties, Mr. Manly devised what was at that period a new multiple-sparking arrangement whereby only one battery, one coil and one contact maker were used for causing the spark in all five cylinders at the proper time. This form of sparking arrangement worked so satisfactorily that it was adopted for the engine of the quarter-size model and also for a new and larger engine which was built subsequently. Almost insuperable difficulties were encountered in obtaining suitable coils, spark plugs and other parts as the development of electric ignition had not progressed to any appreciable extent, and such parts as were ultimately available were very crude productions.

As a result of unremitting effort and the utilization of some of the parts of the engine which had been condemned, an experimental engine for the man-size aerodrome, was actually running on Sept. 18, 1900. As the cylinders were not water-jacketed they were provisionally

cooled by wrapping wet cloths around them, a makeshift which proved sufficient to keep the engine cool for but three or four minutes as a maximum.

This short time was, however, sufficient to enable brake tests to be made, the brake hp. developed under these conditions being $18\frac{1}{2}$ at 715 r.p.m. The engine, with the cloths, weighed 108 lb.

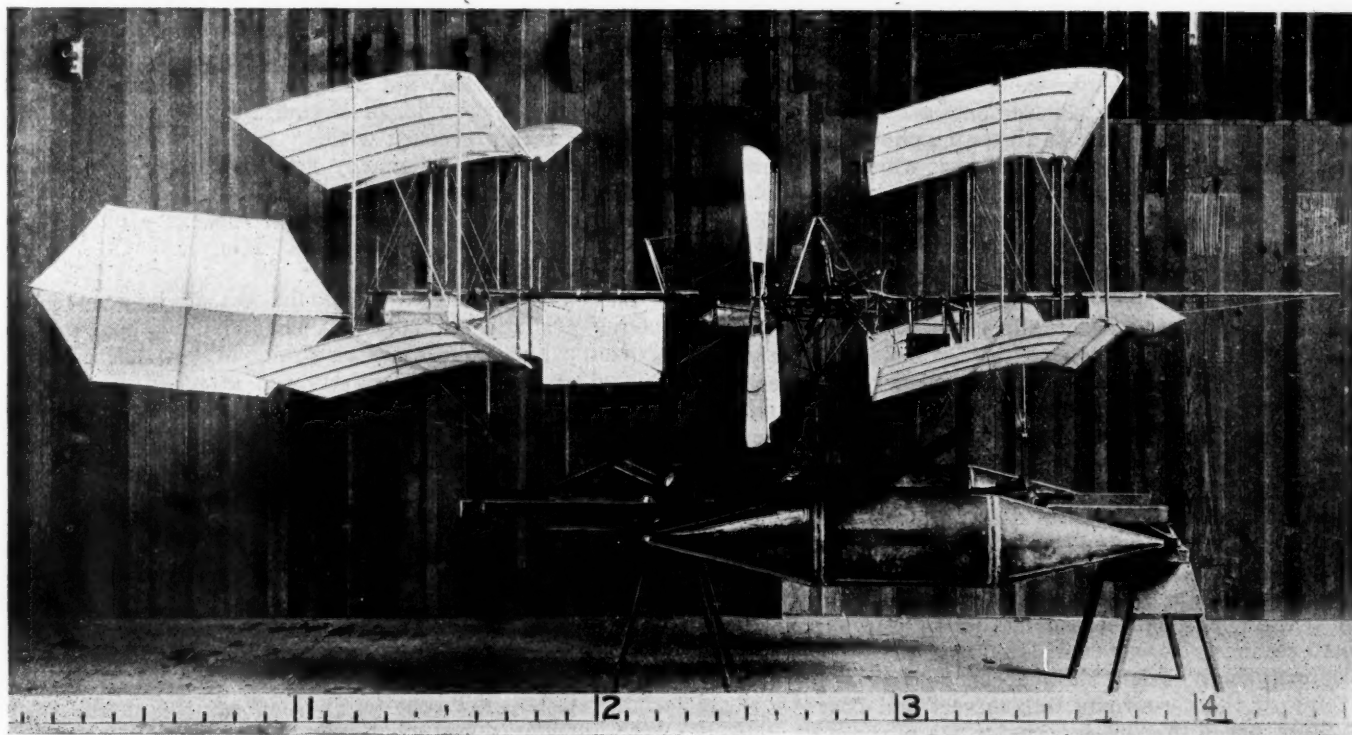
Of course the use of the wet cloths was but a temporary expedient, but the results proved so unsatisfactory it was decided to water-jacket the cylinders and test it out over more extended periods.

It proved impossible to braze the water-jackets directly to the cylinders and they were attached by means of stuffing boxes, a method which resulted in trouble from leaks, but when the work was done it was found that the engine developed $21\frac{1}{2}$ hp. at 825 r.p.m., the total weight of the engine being 120 lb.

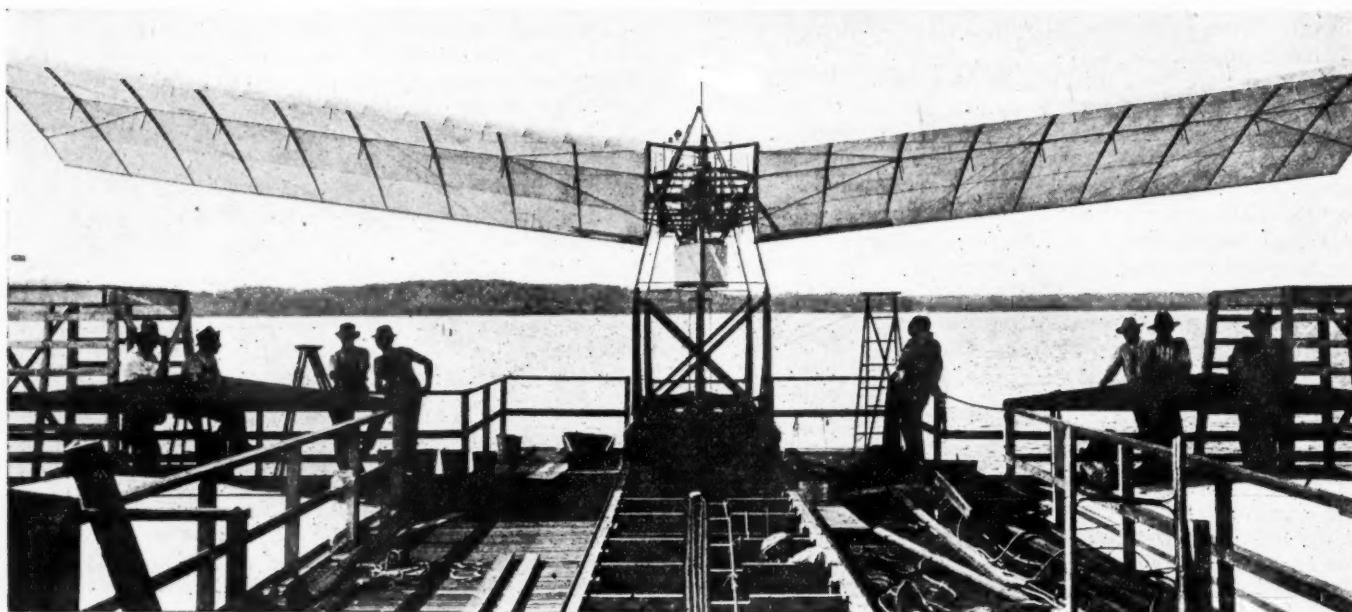
During the construction and testing of this engine it was proved that there were many parts which could be reduced in weight and for this reason it was decided to build an entirely new and larger engine and to install it in a man-carrying machine.

Before this point was reached in the development of the large model, as has already been intimated, the frame and wings of a quarter-size model were in course of construction. In originally planning this model the intention was to make all its linear dimensions exactly one-fourth of the large (or man-carrying) machine, but before the designs were completed it was realized that departures from the scale would be necessary both in the frame and in the propellers, which were increased in size to accommodate the engine and the lifting power. The frame, with these modifications, was completed in June, 1900, but no engine was ready.

As the result of much labor and the utilization of available parts from the small engine which the New York builder had failed to complete a reconstructed engine with stationary instead of rotating cylinders was produced. This developed, when working at its best, between $1\frac{1}{2}$ and 2 hp., as measured by absorption dynamom-



Quarter-size model aerodrome equipped with superposed surfaces. Note the floats attached to the launching car. The plan of starting from the water does not seem to have been actually tried



Man-carrying aerodrome on launching car with front wings in place and guy-wires adjusted. This machine made very brief flights on two occasions

eters, but unfortunately it was found impossible to maintain this power steadily for more than 30 seconds. It was thought possible that by having everything ready for a flight the aerodrome might be launched before the cylinders began to heat seriously and thus the increased cooling caused by rapid motion through the air would enable a sustained flight sufficient to show whether the balancing was correct or not to be made.

Adhering to his theory that where a successful method of conducting an experiment has been discovered only after a long series of failures it is best to continue to use that method rather than to change to some untried plan, Langley decided to keep to his original plan of launching the aerodrome from the top of a houseboat, but in this instance he so far deviated from his rule as to construct floats which were to be attached to the launching car of the quarter-size model in such a way as to convert it into a catamaran raft. These floats are clearly shown in one of the illustrations. In the same photograph may be seen the superposed wing-surfaces which had proved stronger than the single-tier surfaces in the tests of models 5 and 6, referred to in part II of this series.

It was originally planned to use these superposed surfaces without guy-posts, but as it was found that in this case they would have to be made with rigid instead of hinged joints it was eventually decided to use the latter and retain the guy-posts.

After many delays, due to a variety of causes, the quarter-size model was tested from a houseboat on the Potomac in June, 1901. The launching equipment worked perfectly, the aerodrome started on an even keel straight ahead against a light wind. When it had traveled about 100 ft., however, it began to descend slowly, maintaining an even balance and finally touching the water about 150 ft. from the houseboat. The aerodrome was in the air for between 4 and 5 seconds. On a second trial, made when the wings had been dried, it traveled about 350 ft. in 10 seconds. It was considered that these tests, though disappointingly brief, showed conclusively that the balancing of the aerodrome was correct and it was accordingly returned to Washington for the purpose of making new cylinders for the engine.

The new cylinders were constructed from steel tubing originally $\frac{1}{2}$ in. thick, machined with integral radiating

ribs and having combustion chambers screwed and brazed on. With these cylinders the engine was kept relatively cool, but the valves were so small that the gas could not get in and out rapidly enough to enable the engine to furnish full power. The addition of an auxiliary air valve did not improve matters so far as prolonged running was concerned, heating and premature ignition occurring after running about 2 minutes. Before overheating occurred the engine developed 3.2 hp. on the brake at 1800 r.p.m. and even reached 5.1 hp. for a few seconds when running at 3000 r.p.m.

These changes and repairs were completed by October, 1901, but nothing further was done with the quarter-size model until April, 1903. Instead, it was realized that work on the large man-carrying aerodrome was so much more important that the quarter-size model in its completed condition was put aside and the construction and testing of the new large engine for the man-carrying machine were proceeded with.

It was decided to employ steel wherever possible in the engine and this was done with all parts except the bronze bushings for the bearings, the cast-iron pistons and the cast-iron cylinder liners. Many difficulties were encountered.

The engine consisted primarily of a single crankshaft having a single crankpin, the shaft having bearings in a drum which consisted essentially of two heads. Arranged around the crankshaft and attached at equidistant parts of the drum were five cylinders. Innumerable troubles were encountered with overheating, ignition, etc., and were overcome in turn. The finished engine, with two flywheels and cooling water weighed practically 207½ lb. and in its second series of tests it developed 51 hp. at 935 r.p.m. At tests in preparation for St. Louis Exposition the engine was run on three separate trials for a period of ten hours with a constant load of 52.4 hp. at 950 r.p.m. These tests were continuous except for a ten-minute stop to renew the supply of lubricating oil and to change the sparking batteries. As a matter of fact it was not sent to St. Louis as the engine tests were abandoned owing to lack of competition. Further shop tests were made during 1902 and during the early spring of 1903.

On June 14, 1903, everything for the field test being

in readiness, the houseboat was towed to its mooring buoy in the middle of the Potomac about 40 miles from Washington. The flying weight of the aerodrome was 830 lb., including the weight of the venturesome airman, Charles M. Manly. The total area of the wings or supporting surfaces was 1040 sq. ft.

Many weeks of disappointing delay were caused by bad weather conditions, and it was not until Sept. 3 that it was considered feasible to make a test flight. On that day the metal frame of the aerodrome was hoisted to the top of the boat and placed on the launching car and the wings, rudder, etc., made ready, but unfortunately the engine refused to start, owing to deterioration of the dry cells caused by damp weather, and it was necessary to again postpone the test.

It was also found that the glued joints in the cross-ribs of the large wings had been softened by the moisture from the fogs, and it became necessary to re-glue them and to bind the strips together with surgeons' tape. The guy-wires were readjusted to correct the warping of the wings.

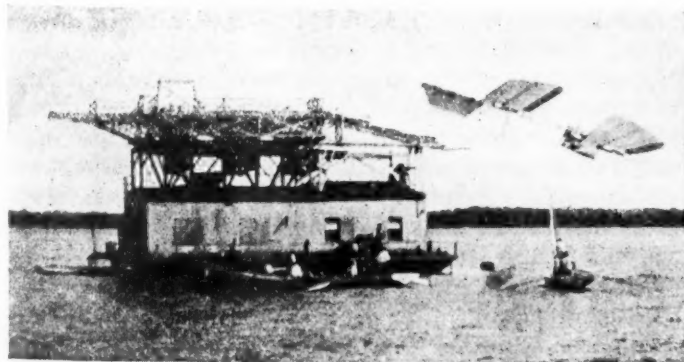
An Actual Flight at Last

When hope of another calm day was almost abandoned, practically ideal conditions came with Oct. 7, when the wind was blowing at the rate of about 12 m.p.h. The launching track pointed down the river, tugboats were in readiness to pick up the daring flier should he meet with an accident, and the aerodrome was then released down its sixty feet of track.

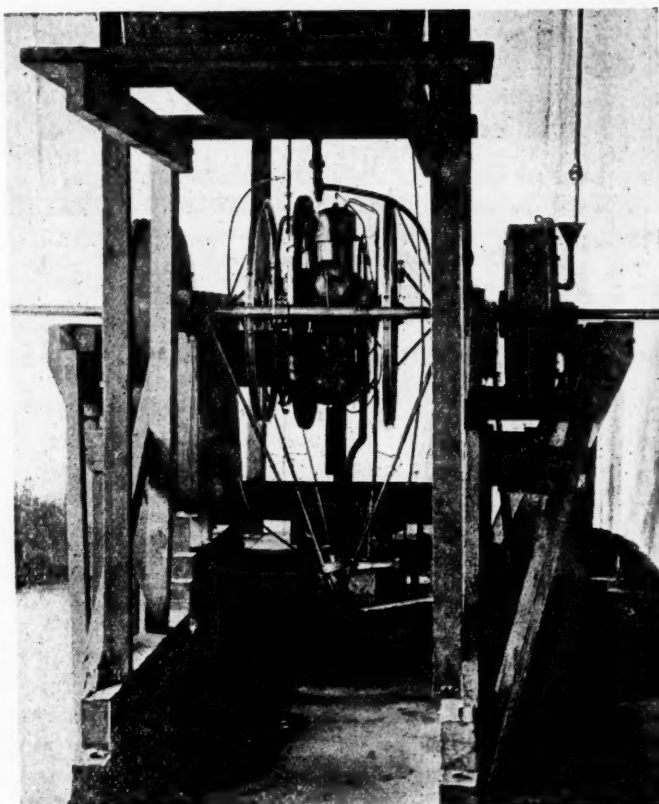
Mr. Manly, in describing his sensations, writes:

"Just as the machine reached the end of the track the writer felt a sudden shock, immediately followed by an indescribable sensation of being free in the air. This had hardly been realized before the important fact was intuitively felt that the machine was plunging downward at a very sharp angle, and he instinctively grasped the wheel which controls the Pénaud tail and threw it to its uppermost extent in an attempt to depress the rear of the machine and thereby overcome the angle of the descent."

Unfortunately Manly was unsuccessful in this, and, realizing he could not avoid a plunge into the river, he braced himself for the shock. The front wings were completely demolished as they struck the water, and Manly extricated himself from the machine by pulling himself up with the aid of the guy-wires. The aerodrome was rescued in a damaged condition, and inspection indicated that the primary cause of the failure was the fact that owing to the distortion of a metal cap the front guy-post was not actually free from the launching car at the moment of starting, thereby causing the front edge of the front wings to be depressed and bending the metal framework.



First of the two flights of the man-carrying aerodrome. Charles M. Manly was the pilot



Dynamometer test of large engine for the man-carrying aerodrome

Weather conditions continued to grow worse and storms interfered with the work, but eventually the houseboat reached Washington on Oct. 12 and the work of making the necessary repairs to the aerodrome was commenced.

Another attempt at flight was made on Dec. 8, when the river was studded with large blocks of floating ice. The wind was gusty, causing great delay in assembling the wings, and darkness was approaching before the actual attempt could be made. Unfortunately the flight was of brief duration, the aerodrome on leaving the track shooting upward in the air, assuming a vertical position with its bow upward, and then, being driven backward by the force of the wind toward the houseboat, where it turned over and came into the water on its back. Manly, who wore a cork-lined jacket which caught in the framework of the machine, had a narrow escape from drowning, but succeeded in freeing himself and getting to the surface, where he was picked up by a boat. The aerodrome was salvaged by tugboats, but was so seriously injured in the process that it was impossible to determine the precise cause of the accident.

Professor Langley at this point felt he could not approve of further expenditures from any Smithsonian fund, Mr. Manly's efforts to obtain financial assistance for purely scientific work proved unsuccessful, and for these reasons, and although success seemed about to crown the efforts of years, experiments were reluctantly abandoned. Langley, the genius who believed implicitly in the possibility of flight with a heavier-than-air machine, unfortunately did not live to see its accomplishment.

That Langley was fully justified in his faith in the possibility of flight in a heavier-than-air machine was demonstrated to the full seven years after his death, when his man-carrying aerodrome rose in the air, piloted by Glen H. Curtiss.

(To be continued)

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Extension of the Aerial Mail Service

A MOST gratifying piece of news comes from Washington, namely, that immediately upon the conclusion of the war an aerial mail line will be established between Chicago and Denver, which may be extended to the Pacific Coast. From all reports the aerial mail service between New York, Philadelphia and Washington, which has now been in operation for practically half a year, has been an all-around success, and the only thing which prevents the immediate establishment of new lines is the inability to spare pilots and machines from the military establishment. But with the coming of peace this obstacle to the expansion of aerial mail service will be eliminated and the aircraft industry will certainly do its best to provide machines of the most suitable type, for the carriage of important mail matter is the most promising peace-time application of airplanes now in sight.

From Chicago to Denver is a distance of approximately one thousand miles, and at the same rate of speed as is maintained between New York and Washington should be covered in about 12 hr. The country between the two cities is for the most part level and makes for ideal conditions in aerial navigation. Difficulties will be encountered when it is attempted to extend the line from Denver west to the Coast, as then two mountain ranges will have to be crossed, but with the present development of aerial equipment these should not be a serious obstacle.

The Post Office is to be congratulated upon the success it has made of the New York-Washington line and the foresight it is showing in planning new lines at the present time for use at the end of the war, so that our aircraft industry may be switched from war-work to peace production with the least disturbance and at the same time the country's commercial interests may at the earliest possible time enjoy the advantages of high-speed aerial mail service.

Encouraging Research Work

ONE effect of the war has been to bring strongly to public attention the great value of scientific and industrial research. It was the extensive research done by large firms in Germany that enabled that country to build up world-wide monopolies in such industries as aniline dyes, optical glass, etc. England previous to the outbreak of the war was dependent upon Germany for products of many kinds which were absolutely indispensable in warfare, and the awakening when it was realized that all sources of supply for these products had suddenly been cut off was a rather rude one. It was then realized that not sufficient attention had been paid to scientific work as related to industrial processes, and that if England wanted to maintain its position as a leading industrial country she would have to mend her ways. As a result, during the past two or three years British engineering papers have devoted much space to the subject of research, and especially to co-operative research by associations of firms in particular industries.

Research work is necessarily expensive, and only very large industrial organizations can afford to maintain a competent staff with proper equipment. Probably one of the reasons why England has lagged behind in this development is that the great majority of her manufacturing concerns are of moderate size. Naturally, all of the firms engaged in the same line of industry are confronted by much the same problems and if some of these problems can be investigated on a co-operative basis it will be of advantage all around. Heretofore industrial concerns have done their research and experimental work individually and have jealously guarded the results.

Strictly scientific research work has in the past been confined almost entirely to the universities, and it must be admitted that most of the great scientific discoveries have been made in university laboratories or at least by men connected with such insti-

tutions. Recently the complaint has often been made that the staffs of the universities, as a rule, are not in sufficiently close touch with practical developments to enable them to produce the results desired by the industries. They often pursue scientific work for its own sake and not because the results may be of practical value.

Government encouragement of scientific research is not by any means a new development, for such government-supported institutions as our own Bureau of Standards, the British National Physical Laboratory and the German Imperial Physical-Technical Institute have done much work that has been helpful in the development of industrial processes and products. During the war the activities of these institutions have been greatly extended, war requirements having made it necessary to get quick solutions of many important industrial problems. But instead of there being a let-up in this work at the close of the war, there will most likely be further expansion of it. Many industries that formerly were conducted by rule of thumb methods are getting onto a scientific basis and this will emphasize the need for research work.

The British scheme of industrial research associations provides for this. A fund of a million pounds sterling has been voted by Parliament from which grants will be made to such associations for work approved of by the Advisory Council on Scientific and Industrial Research. One of the great problems which will be attacked by one of these associations is that of a home produced motor fuel. The organization of the committee and the voting of the fund marks a step in government encouragement of industry of which we are likely to see much more after the war.

Tractor Sizes

INCREASING evidence is accumulating that the big demand in the tractor field in the future will be for a three-plow machine. There has been in the past a tendency to cut up farms into smaller ones, which was perhaps a direct result of the increase in population, but it is very much to be doubted whether this will continue if farming is revolutionized by the general adoption of power methods. This opinion is based not merely on theoretical reasoning but is supported by the experience of large numbers of tractor-owning farmers. A three plow tractor is the smallest size which is capable of delivering sufficient belt power for operating a separator, and this is a most important point, now that small "individual" threshers are rapidly ousting the large steam-operated custom outfits. Moreover, the three-plow tractor does so much more work than a two-plow horse outfit that the saving in operator's time is quite an item. Just at present the greatest inducement to the farmer in buying a tractor is the saving in manpower which it makes possible, and the three-plow is really the smallest outfit that affords an appreciable saving in this respect. Aside from the saving in operator's time there is undoubtedly a gain in mechanical efficiency because the two-plow trac-

tor, for instance, has to propel itself a 50 per cent greater distance per acre plowed than the three-plow, and unless it weighs one-third less, which it seldom does, the energy spent in moving the tractor around the field is greater in the case of the smaller machine.

Every theoretical argument that can be advanced in favor of the three-plow machine, as compared with smaller ones, holds equally when applied to the four-plow, and where the farmer has sufficient acreage a four-plow and even larger outfit is advisable. But it appears from the testimony of farmers who have been using tractors that a three-plow outfit can handle the work of the average corn belt farm, of 160 to 320 acres, very well.

"Rearing" of Tractors

ATRACTOR in its make up is very much like an automobile, only it is geared down much more, and consequently the force component of the power at the driving wheels is much greater and the speed component correspondingly smaller. Like all other machines of great weight and power, it involves certain dangers to the operator, and while in an automobile the risks of personal injury are intimately connected with the speed of the machine, in the tractor they are more related to the enormous torque impressed upon the driving wheels.

It has long been known that in a tractor, when the power is applied to the drive, weight is automatically shifted from the front to the rear wheels and the machine has a tendency to "rear." Under all ordinary conditions of operation the turning moment due to this torque reaction is not equal to the opposing weight moment around the rear axle, and there is no other result than that the steering may become somewhat erratic owing to the front wheels being pressed insufficiently against the ground.

However, in the case of extra hard pulls the forward part of the tractor may possibly "rear up," and such an occurrence naturally involves serious risks for the driver. The chance of rearing is closely connected with the distribution of weight and with the wheel base. It is less the greater the proportion of the weight that normally rests on the front axle and also the longer the wheelbase.

Rearing, of course, is also influenced by the hitch or drawbar attachment, for if the line of drawbar pull passes above the rear axle center line it tends to promote rearing, whereas if it passes below it tends to prevent it.

This question of the lengthwise stability of tractors demands the serious consideration of designers. It would be possible to provide safeguards, such as skids extending rearwardly and downwardly from the rear end of the frame. However, the provision of sufficient inherent stability by making the wheelbase fairly long and placing an ample amount of weight forward would seem to be preferable. A study of weight moment around the rear axle in tractors of different horsepower ratings should be profitable in this connection.

□ Latest News of the

Wright-Martin Earns \$540,678

Operations for 13 Months—
Hispano Engine Production
to Be 750 Per Month

NEW YORK, Oct. 31—The Wright-Martin Aircraft Corp. made net profits of \$540,678 during the 13 months ending June 30, which is looked upon as a substantial profit in view of the fact that the company's operations in the 7 months from May 31 to Dec. 31, 1917, showed a deficit of \$189,000. In the following 6 months, however, net profits were \$729,678, wiping out the loss and making a net profit for the period as given. The report points out that because operations are on a cost-plus basis it is difficult to show the amount of gross business in a given period.

During this 13-month period practically the entire resources of the company have been used to produce Hispano-Suiza engines for the United States Government. About a year ago the production of Simplex automobiles was discontinued and this work will not again be taken up until after the war. An order for 450 Hispano-Suiza engines for the French Government was completed about a year ago and since July, 1917, the company has received orders from the United States Government for 7500 engines of the same general type to be produced at the New Brunswick plants and for 5000 of the new 300-hp. engines to be produced in another factory prepared at the expense of the Government. Including the original French order, the company has produced approximately 4000 engines with spare parts. At present the output of the New Brunswick plants is about 600 engines per month, and it is estimated that the maximum output of 750 per month with spare parts will be reached early in 1919.

"For the production of the new 300 hp. engine," says the report, "the Government has provided the company with the use of the factory previously owned by the General Vehicle Company at Long Island City, N. Y. These facilities have been very much enlarged and equipped with thoroughly modern machinery. The tooling is now nearly completed for the initial deliveries which will start at an early date, and the volume of production from this factory will reach large proportions by the summer of 1919. These facilities have been provided entirely at the expense of the Government and are its property.

"In addition to these two factories, exclusively operated upon Hispano-Suiza motors, the Pierce-Arrow Motor Car Company of Buffalo, N. Y., has been sub-licensed at a reasonable rate of royalty to produce a considerable number of the 300 hp. motors for

the United States Government. The greater part of the facilities of the H. H. Franklin Manufacturing Co. of Syracuse, N. Y., will also be engaged in making parts for these contracts as a sub-contractor.

"In order to obtain the output of 150 hp. and 180 hp. motors required, extensive additions to the company's factory at New Brunswick have been necessary. The last of this development work will be completed by December of this year and will provide one of the best equipped aeronautical motor factories in the world. When this work is completed, the company will have a plant investment of something over \$5,500,000, made up of about \$2,000,000 pre-war plant and the remainder of increased facilities provided for the performance of these contracts. The contracts with the Government provide for either special depreciation or liquidation of such increased facilities, so that when final adjustments under the company's contracts have been completed the company will not be burdened with an undue plant investment.

"The company's interests are also adequately protected in the event of any or all of these cost-plus contracts being cancelled.

"After the period of experimental development on the 150 hp. motor had been passed, the company set up as a deferred charge a reasonable portion of the cost of this development which it is absorbing at the rate of \$180 per motor." All directors were re-elected.

PROFIT AND LOSS STATEMENT

Income	\$2,216,574
Depreciation	366,669
Amortization of patents	329,650
Hispano-Suiza motor development written off	479,577
Balance	\$1,040,678
Reserve for war profits, income and other taxes	500,000
Net profits	\$540,678

CONSOLIDATED BALANCE SHEET

Assets		June 30, 1918	May 31, 1917
Property and plant acc't.		\$3,408,504	\$2,332,933
Cash		2,102,682	2,573,959
Accts. and notes receiv.		584,605	262,112
Due from U. S. Gov't.		4,388,039	
Inventories		384,927	1,819,887
Investments		50,884	16,000
Deferred charges		72,114	178,281
Patents		675,333	1,004,271
Hispano-Suiza motor, dev. costs		689,704	1,110,730
Total		\$12,356,797	\$9,298,173

Liabilities

*Common stock	\$4,542,855	\$4,014,566
Preferred stock	5,000,000	5,000,000
Simplex Co. outstanding shares		1,800
Res. for war taxes, etc.	500,000	13,575
Accounts payable	1,644,736	242,017
Accrued wages, etc.	669,206	26,215
Total	\$12,356,797	\$9,298,173

*897,558 shares, no par value.

To Make Airplane Parts

DETROIT, Oct. 29—The newly incorporated B. & H. Machine Products Co., 1161 Ellery Street, will confine its efforts to government machine production work entirely, manufacturing parts essential to airplane and truck engines.

American Exporters Convene

Building Up of Foreign Trade
Requires Education, Financial
Help and Advertising

NEW YORK, Oct. 31—The necessity for proper and adequate financial assistance, the need of thorough education both of foreign buyers and those who come in contact with them, and the value of systematic advertising were the keynotes of the ninth annual convention of the American Manufacturers Export Association which opened here yesterday. The gathering was one of the largest in the history of the organization, nearly 1500 delegates being in attendance. For the first time the meeting was thrown open to the general public, having heretofore been closed to members of the association.

Questions of adequate financial assistance are paramount in the opinion of Lewis E. Pierson, president of the Irving National Bank, who presided at one of the sessions; and most important under this subject comes the more general use of the trade acceptance.

"We all realize that the demands of the future will require that national resources be kept in a most highly available condition," said Mr. Pierson, "but at the same time we continue the employment of commercial credit practices, among which the open account is a conspicuous illustration, which in their operations tend to render a large portion of these resources unavailable for the business purposes they are supposed to serve, while the acceptance method, of obvious merit in this connection, only during the past year has been able to demand serious consideration from American business and finance."

Foreign trade will never be built up to assume proportions which will insure American leadership without proper education, according to W. W. Nichols of the Allis-Chalmers Mfg. Co. Mr. Nichols said in part:

"It requires no argument to prove that the kind of farm trade which the U. S. establishes will depend upon the character of the education it employs in cultivating ideas and creating a wise appreciation adequate to an enterprise of such moment to the welfare of the nation. Education should be divided into two parts: The education of public opinion from its birth comes foremost because public opinion will shape all federal legislation to make or break our enterprise. And second, the peculiar education of the individual whose life work will be foreign trade."

"Unless a firm is prepared to set aside a certain sum of money for export advertising, map out some kind of a plan to spend it, and then go ahead and spend it, the matter is better left alone," said David L. Brown, manager of the Goodyear Tire & Rubber Co.

(Continued on page 769)

Automotive Industries □

Can Sell Parts for Repairs

War Industries Board Permits Sale When Used for Passenger Cars

WASHINGTON, Oct. 31—Following conferences here between members of the automobile industry and the War Industries Board, the board has decided that regardless of pledges exacted from electrical and ball bearing makers to sell their products to essential consumers only, manufacturers will act within the meaning of the pledge if they sell the parts to dealers and jobbers to be used for the repair and maintenance of passenger automobiles.

The conference was held because many manufacturers who had signed the pledge felt that it would be a violation of it to sell parts for the up-keep of passenger cars which are not on the essential list. The decision of the War Industries Board stating that Class C priority will be provided for parts for the repair and for replacements on passenger cars removes the restrictions from manufacturers and they may now make sales accordingly. In answer to a request that priority also be given to materials to be used in making repair parts for passenger cars, the board stated that since current requirements are being cared for, it would prefer to take the matter up at a later date prior to Jan. 1, 1919.

The conference with the board was preceded by a meeting of the various representatives of the industry at the National Automobile Chamber of Commerce offices in Washington, which was attended as well as the War Board conference by:

Hugh Chalmers, Detroit, vice-president, National Automobile Chamber of Commerce; Alfred Reeves, Washington, general manager, National Automobile Chamber of Commerce; Sidney F. Beech, Chicago, president National Association of Automobile Accessory Jobbers; N. H. Oliver, Chicago, Manufacturers' Division, National Association of Automobile Accessory Jobbers; F. W. A. Vesper, St. Louis, president National Automobile Dealers' Association; Bart J. Ruddle, Milwaukee, National Automobile Dealers' Association; C. E. Thompson, Cleveland, vice-president, Motor and Accessory Manufacturers' Association; J. G. Utz, Cleveland, Motor and Accessory Manufacturers' Association.

Automobile taxes and the possibilities of passenger car production after Jan. 1, 1919, were also discussed at the N. A. C. offices and will be taken up again in

the near future. Following are the decisions of the War Industries Board in complete text:

1. We have considered your suggestion provision be made for giving a degree of preference for materials for making repair parts for passenger automobiles in service, in addition to the provision which has been made for passenger automobiles and repair parts pursuant to letter of the War Industries Board of date, Aug. 24, 1918.

2. This division is advised by the Automotive Products Section that your current requirements of materials for repair parts are being taken care of, and that being so, this division would prefer not to change the current arrangement until the expiration of the period covered by the letter.

3. Prior to Jan. 1, 1919, you are invited to take the matter up again with this division and at that time, war conditions permitting, we will endeavor to give a degree of preference to you for materials to take care of repairs for all cars in service from that date forward.—Rhodes S. Baker, Assistant Priorities Commissioner.

1. We have given consideration to the matters which you have brought up relating to repairs to passenger automobiles and repairs and replacements to equipment to same.

2. Supplement No. 2, issued Oct. 15, 1918, to Circular No. 4, issued July 1, 1918, by this division, among other things provides Class C priority rating "for all necessary repairs to equipment, vehicles, implements and machinery of every nature whatsoever."

3. This division rules that repairs to passenger automobiles and replacement of parts, material and equipment therefor are included in the foregoing language; and that the making of repairs to such automobiles and the furnishing of parts, material and equipment to repair same is authorized.—Rhodes S. Baker, Assistant Priorities Commissioner.

American Exporters Convene

(Continued from page 768)

"An appropriation for a given period of time and a schedule, are just as important abroad as they are in this country."

George Edward Smith, Royal Typewriter Co., was elected president, other officers elected being: vice-presidents, William Ingersoll, Robert Ingersoll & Bros.; H. L. Willson, Columbia Graphophone Co.; J. S. Lawrence, Lawrence & Co.; Julius Goslin, Joubert, Goslin Mfg. Co.; George H. Meyercord, Meyercord Co. Directors: H. S. Demarest, Greene, Tweed & Co.; F. S. Seiberling, Goodyear Tire & Rubber Co.; F. A. Taylor, S. S. White Dental Mfg. Co.; C. K. Anderson, American Wire Fabric Co.; J. A. Farrell, U. S. Steel Corp.; E. M. Herr, Westinghouse Electric & Mfg. Co.; A. C. Bedford, Standard Oil Co.; W. W. Nichols, Allis-Chalmers Mfg. Co.; W. C. Durant, General Motors Export Co.; W. L. Saunders, Ingersoll, Rand Co.; R. A. Shaw, National Aniline Chemical Co.

Nation's Fuel Supply Adequate

Fuel Administration States There Is More Coal Stored Than at Any Previous Time

WASHINGTON, Oct. 29—The nation's fuel supplies, assembled in preparation for an unusual winter, are adequate and well distributed, according to a statement made to-day by the Fuel Administration. Continued economy, however, will be necessary.

More domestic coal is in the hands of consumers at present, says the statement, than at any corresponding period of the previous year. The upper Great Lakes districts, which usually suffer from coal shortage, have received the greatest proportionate supplies, and all sections of the country, in fact, are stocked up with more coal than at the corresponding period in pre-war years.

Expect to Save 50,000,000 Tons

Twelve million seven hundred thousand tons have been saved for war purposes by curtailment of less essential industries. For the first half of the coal year it is expected that 50,000,000 tons will be saved during the entire year.

"The Fuel Administration," stated Dr. Garfield, "approaching the winter season, was organized with stocks of coal on hand far in excess of stocks of other years. We are ready for an unusually severe winter, but we are still and shall continue to be dependent upon the co-operation of the people of the United States in conserving fuel, and upon the several agencies concerned in the production and transportation of fuel to enable us to carry through our program to the end of the year."

Oil Shortage Caused by Overseas Demand

The oil situation, according to the report, will be somewhat acute this winter owing to the steadily increased domestic and overseas demands. Stocks on hand show 6,000,000 gal. of gasoline and naphthas and 9,400,000 gal. of kerosene for Sept. 1, 1918, as compared with 6,025,000 gal. of gasoline and naphthas and 11,600,000 gal. of kerosene on hand Sept. 1, 1917.

The solution of the oil problem is one of transportation. Tank ships are scarce and existing pipe lines are operating at capacity. Additional pipe line capacity is being built in Texas, but the transportation of this oil to the North Atlantic ports from the Gulf ports involved additional tank steamers which are not now available.

Set Standards for Women Workers

War Labor Policies Board Establishes Rules Governing Employment—Equality of Wages With Men and One Day Rest in Seven Required

WASHINGTON, Oct. 28—Labor standards for women engaged in war work have been established by the War Labor Policies Board. They include stipulations for 1 day rest in 7, 8-hour working days, equal wages with male workers, sanitary working conditions, one-half holidays on Saturdays, regulations for hazardous work and methods of employment of women. The standards are based upon past experiences observed by the board and are closely in accord with recommendations issued early in the war by the Quartermaster Department. All contracts of the federal departments will hereafter, by direction of the War Labor Policies Board, contain clauses requiring full compliance with State labor laws. Officials of the State Labor Department in each State will be deputized by the heads of the contracting departments of the Federal Government to co-operate with federal agencies in enforcing these provisions of the contracts. Following is the summary of the required standards:

B. STANDARDS RECOMMENDED FOR THE EMPLOYMENT OF WOMEN.

I. Hours of Labor

1. **Daily Hours**—No woman shall be employed or permitted to work more than 8 hours in any one day or 48 hours in any one week except that in cases of emergency women may work overtime provided that the total working day, inclusive of overtime, shall not exceed the legal working day in the state and shall never exceed 10 hours as a maximum, and provided that the total working week, inclusive of overtime, shall not exceed the legal working week in the state and shall never exceed 55 hours as a maximum. The time when the work of women employees shall begin and end and the time allowed for meals shall be posted in a conspicuous place in each room and a record shall be kept of the overtime of each woman worker.

2. **Half Holiday on Saturday**—Observance of the Saturday half-holiday should be the custom.

3. **One Day of Rest in Seven**—Every woman worker shall have one day of rest in every seven days.

4. **Time for Meals**—At least one-half hour shall be allowed for a meal if the working day is 8 hours or less. If the working day is longer than 8 hours at least three-quarters of an hour shall be allowed for a meal.

5. **Rest Periods**—A rest period of 10 minutes should be allowed in the middle of each working period without thereby increasing the length of the working day.

6. **Night Work**—No woman shall be employed between the hours of 10 p. m. and 6 a. m. unless the plant holds a special certificate issued for this purpose by the Secretary of War or the Secretary of the Navy with the approval of the Secretary of Labor.

II. WAGES

1. **Equality With Men's Wages**—Women doing the same work as men shall receive the same wages with such proportionate increases as the men are receiving in the same industry. Slight changes made in the pro-

cess or in the arrangement of work should not be regarded as justifying a lower wage for a woman than for a man unless statistics of production show that labor cost of the job in question is higher when women are employed than when men are employed. If a difference in cost is demonstrated the difference in the wage rate should be based upon the difference in production for the job as a whole and not determined arbitrarily.

2. **The Basis of Determination**—The minimum wage rate should cover the cost of living for a family and not merely for the individual.

III. WORKING CONDITIONS

1. **Comfort and Sanitation**—State labor laws and industrial codes should be consulted with reference to provisions for comfort and sanitation. Washing facilities, with hot and cold water, soap and individual towels, should be provided in sufficient number and in accessible locations to make washing before meals and at the close of the work day convenient. Toilets should be separate for men and women, clean and accessible. Their numbers should have a standard ratio to the number of workers employed. Workroom floors should be kept clean. Dressing rooms should be provided adjacent to washing facilities, making possible change of clothing and the care of clothing outside the workrooms. Rest rooms should be provided. Lighting should be so arranged that direct rays do not shine into the worker's eyes. Ventilation should be adequate and heat sufficient. Drinking water should be cool and accessible with individual drinking cups or bubble fountains provided. Provisions should be made for the workers to secure a hot and nourishing meal eaten outside the workroom, and if no lunch rooms are accessible near the plant, a lunch room should be maintained in the establishment.

2. **Posture at Work**—Continuous standing and continuous sitting are both injurious. A seat should be provided for every woman employed and its use encouraged. It is possible and desirable to adjust the height of the chairs in relation to the height of machines or work tables, so that the worker may with equal convenience and efficiency stand or sit at her work. The seats should have backs. If the chair is high a foot rest should be provided.

3. **Safety**—Risks from machinery, danger from fire, and exposure to dust, fumes or other occupational hazards should be scrupulously guarded against by observance of standards in State and Federal codes. First aid equipment should be provided.

4. **Uniforms**—Uniforms with caps and comfortable shoes are desirable for health and safety in occupations for which machines are used or in which the processes are dusty.

IV. HOME WORK

1. No work shall be given out to be done in rooms used for living or sleeping purposes or in rooms directly connected with living or sleeping rooms in any dwelling or tenement.

V. EMPLOYMENT MANAGEMENT

1. **Hiring, Separations and Determination of Conditions**—It has been demonstrated that the most effective results in the relationship between a company and its employees depend upon a personnel department

charged with responsibility for selection, assignment, transfer or withdrawal of workers and the establishment of proper working conditions. This is especially important at a time when the withdrawal of men for military service necessitates changes in personnel, including the more extensive employment of women.

2. **Supervision of Women Workers**—Where women are employed, a competent woman should be appointed as employment executive with responsibility for conditions affecting women. Women should also be appointed in supervisory positions in the departments employing women.

VI. CO-OPERATION OF WORKERS IN ENFORCEMENT OF STANDARDS

1. The responsibility should not rest upon the management alone to determine wisely and effectively the conditions which should be established. The genuine co-operation essential to production can be secured only if definite channels of communication between employers and groups of their workers are established. The need of creating methods of joint negotiation between employers and groups of employees is especially great in the light of the critical points of controversy which may arise in a time like the present. Existing channels should be preserved and new ones opened if required, to provide easier access for discussion between an employer and his employees.

VII. INTRODUCTION OF WOMEN INTO NEW POSITIONS

1. **Analysis of Occupations**—When the introduction of women into new positions is contemplated, each occupation in the plant should be carefully analyzed to determine whether women may be employed under existing conditions or what changes should be made to adapt it to women. This analysis should show what the job is, what it requires of the workers in strength, nervous energy, posture, skill and education, what the working environment is and what hazards can be eliminated or reduced. Attention should be centered especially on the following conditions which would render the employment of women undesirable if changes are not made:

- A—Constant standing or other postures causing physical strain.
- B—Repeated lifting of weights or other abnormally fatiguing motions.
- C—Operation of mechanical devices requiring undue strength.
- D—Exposure to excessive heat, that is over 80 degrees; or excessive cold, that is under 50 degrees.
- E—Exposure to dust fumes or other occupational poisons not inherent in the essential nature of the processes.
- F—Isolation employment or conditions involving moral hazard.

2. **Selection of Workers**—When the occupations have been selected in which it is desirable to introduce women, the selection of workers best adapted to these occupations through physical capacity, experience and other qualifications is as important as the determination of the conditions of the work to be done.

3. **Training**—Opportunities for training should be provided, since experience shows that the employment of women without preliminary training results in high labor turnover and reduction of output.

VIII. CO-OPERATION WITH OFFICIAL AGENCIES

The United States Government and State and local communities have established agencies to deal with conditions of labor, including standards of working conditions, wages, hours, employment and training. These should be called upon for assistance, espe-

cially in the difficult problems of adjustment brought by war conditions with the resulting necessity for greatly extending the employment of women.

Inquiries regarding the employment of women may be addressed to the Woman in Industry Service, Department of Labor, Washington, D. C., and these will be dealt with directly or referred to the official Federal or State Agency best equipped to give the assistance needed in each instance.

Searching for Oil Pools

WASHINGTON, Oct. 28—The Mid-Continent, Texas, Gulf Coastal Plain and Wyoming regions are regarded as containing the greatest number of undiscovered oil pools in this country by the United States Geological Survey, Department of the Interior. In Wyoming the survey is mapping out anticlines and domes that probably contain oil, and the land in these areas will be opened to prospecting as soon as the bill before Congress providing for the leasing of such lands in the public domain is passed.

In the Mid-Continent field the Osage Reservation in Oklahoma is said to give promise for rapidly increasing the available oil supplies of the country. Examinations in this region by the survey are nearing completion and show the presence of many untested anticlines and domes, most of which will be found to contain commercial deposits of oil. Many good pools have already been developed in this section, but not half of the reservation has yet been leased for oil, and more than 1,160,000 acres belonging to the Indians remain to be opened. The Office of Indian Affairs is arranging to lease this land for development.

Copper Price Unchanged

WASHINGTON, Oct. 28—The President has approved an agreement made between the copper producers and the War Industries Board that the maximum price of copper will be continued at 26 cents per pound, taking effect Nov. 1, 1918, and subject to revision after Jan. 1, 1919. This price is f.o.b. cars or lighters at Eastern refineries, f.o.b. cars or lighters at Pacific Coast refineries for Pacific Coast destinations, and f.o.b. cars or lighters at New York for shipping to Eastern or interior destinations from Pacific Coast refineries and from refineries in the interior of the United States. All shipments made after Jan. 1, 1919, are subject to any change in price taking effect after that date as made by the Price Fixing Committee of the War Industries Board. The maximum price of 26 cents is subject to the additional changes on copper shapes approved by the Price Fixing Committee on June 5, 1918.

Chicago Office for "Kepuruber"

CHICAGO, Oct. 28—The Rubber Preserving Co., manufacturer of "Kepuruber," a liquid to prevent the deterioration of tires and other rubber articles, has established sales offices at 752 Otis Building, Chicago.

Government's Prices for Trucks

Complete List of Contracts Placed for "B" Trucks and "A" and "B" Bodies

WASHINGTON, Oct. 25—Following is the complete list, together with prices paid, of orders placed by the Quartermaster Department for class B trucks, class A truck bodies and class B truck bodies. In each contract on the B trucks the Government furnished the eleven major units:

B Trucks—Chassis

United Motors Co., Grand Rapids, Mich., 500.....	\$892.00
Signal Truck Co., Detroit, 500.....	960.00
Vim Motor Co., Philadelphia, Pa., 500	1,069.83
Winthrop Motor Truck Co., Winthrop Harbor, Ill., 500.....	1,147.50
Brockway Motor Truck Co., Cortland, N. Y., 1000.....	1,137.00
Denby Motor Truck Co., Detroit, 1500	1,132.57
Lewis Hall Iron Works, Detroit, 500..	1,137.00
Republic Motor Truck Co., Alma, Mich., 2000.....	1,138.00
Bethlehem Motor Truck Co., Allentown, Pa., 1500.....	1,162.50
Diamond T Motor Car Co., Chicago, 2000	1,150.00
Rowe Motor Mfg. Co., Lancaster, Pa., 500	1,200.00
J. C. Wilson Co., Detroit, 500.....	1,200.00
Sterling Motor Truck Co., Milwaukee, Wis., 750.....	1,187.50
Indiana Motor Truck Co., Marion, Ind., 1500.....	1,162.50
Clyde Cars Co., Clyde, Ind., 500.....	1,200.00
Maccar Co., Scranton, Pa., 500.....	1,200.00
United States Motor Truck Co., Cincinnati, Ohio, 1500.....	1,162.50
Gramm-Bernstein Motor Truck Co., Lima, Ohio, 2000.....	1,500.00
Service Motor Truck Co., Wabash, Ind., 750.....	1,187.50
Standard Motor Truck Co., Detroit, 750	1,187.50
Atterbury Motor Car Co., Buffalo, N. Y., 750.....	1,187.50
Midland Motor Truck Co., Oklahoma City, Okla., 500.....	1,200.00
Velle Motor Corp., Moline, Ill., 2000..	1,150.00
Selden Motor Truck Co., Rochester, N. Y., 2000.....	1,150.00

Class A Bodies

	Prices include troop seats and export crating.
Auto Body Co., Lansing, Mich., 3000.....	\$112.75
Dort Motor Car Co., Flint, Mich., 1000.	135.50
Hercules Buggy Co., Evansville, Ind., 2000	143.00
Mitchell Motors Co., Racine, Wis., 1500	143.00
Grand Rapids School Equipment Co., Grand Rapids, Mich., 1500.....	143.00
International Harvester Co., Chicago, 2000	143.00
Glasscock Bros. Mfg. Co., Muncie, Mich., 1500.....	143.00
Kuhlman Car Co., Cleveland, Ohio, 1000	143.00
Field Mfg. Co., Owosso, Mich., 500....	143.00
Mulholland Co., Dunkirk, N. Y., 500....	143.00
Highland Body Co., Cincinnati, Ohio, 500	143.00

Class B Bodies

	Price of body troop seats crated for export
Buick Motor Co., Flint, Mich., 3000...\$130.97	
W. E. Stewart Body Co., Flint, Mich., 3000	130.97
Dunbar Mfg. Co., Chicago, 3000.....	132.00
Chevrolet Motor Co., N. Y., 3000.....	139.50
Biddle & Smart Co., Amesbury, Mass., 3000	141.00
Beaudette Co., Pontiac, Mich., 3000....	150.00
Grand Rapids School Equipment Co., Grand Rapids, Mich., 3000.....	150.00
International Harvester Co., Chicago, 3000	150.00
Griswold Motor & Body Co., Detroit, 1000	150.00
Dort Motor Car Co., Flint, Mich., 1000.	150.00

Monroe Body Co., Pontiac, Mich., 1000. 150.00
Keystone Vehicle Co., Reading, Pa., 5000

Immense Store of Manganese Ore

WASHINGTON, Oct. 26—More than 250,000 tons of manganese ore has been located by experts of the United States Geological Survey, Department of the Interior, in Jackson County, Oregon. The Survey has been examining deposits of manganese and manganiferous ores in various parts of the United States for the last two years, because of the limitation of shipping facilities which has reduced manganese ore imports from all sources other than the West Indies and Central America in 1918 one-third below those of 1917. There is a prospect that there will be further import limitations imposed in 1919.

The importation of the iron-manganese alloy ferromanganese has decreased in greater proportion and will probably soon be stopped entirely. To offset this decrease of manganese deposits in this country and the West Indies the Geological Survey has been examining them with the view of determining the availability of the ore. Domestic producers responding to the increased demand have raised production from 27,000 tons in 1916 to 116,000 tons in 1917 and it is probable that production in 1918 will be 185,000 tons.

Investigations in Oregon show the manganese oxides in quantities ranging from 15 per cent to 52.8 per cent in the ore collected in Jackson County. Car samples of two shipments of the concentrate ran 47.5 and 48.5 of manganese and assays of other samples of concentrates are reported as follows:

	Gold	Silver	Iron	Manganese	Phosphorus
1	0.08	11.1	1.2	52.5	0.09
2 .....	.08	14.5	1.4	46.5	.207
3 .....	.16	11.15	.9	52.8	.174

About 1500 tons of ore containing at least 15 per cent of manganese is "in sight." In addition, incomplete prospecting by drilling and by open cuts indicates that at least 4 acres are underlain by 10 ft. of ore, about 120,000 tons, containing probably 10 per cent of manganese. The surface indications in other parts of the district warrant an estimate that they may yield 130,000 tons of ore carrying at least 10 per cent of manganese, so that the probable reserves of ore of this grade amount to more than 250,000 tons.

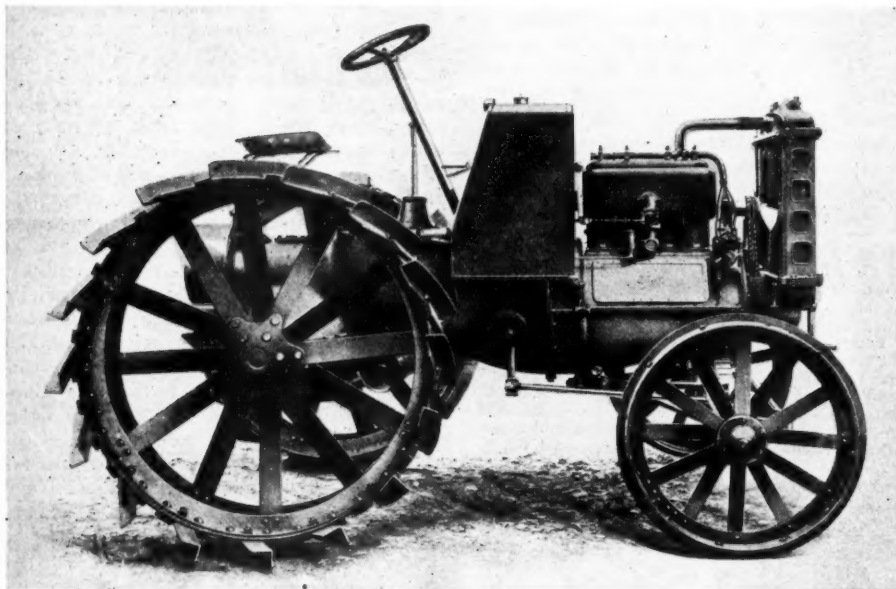
Manganese is one of the vitally important metals used both for war and non-war work. In the form of ferromanganese it is alloyed with steel to make manganese steel and the manganese dioxide is used in the manufacture of dry batteries. More than 95 per cent of all the manganese consumption in this country, however, is used principally in making all Bessemer and open-hearth steels, in which it is incorporated in the form of iron-manganese alloys, which serve as deoxidizers and purifiers of the molten metal.

The Lake Creek district of Jackson County, Oregon, where the greatest deposits have been found, has just lately undertaken the mining of manganese.

Fiat Develops Worm-Drive Tractor

Four-Wheel Machine with Four-Cylinder Vertical Engine of Standard Type—Design Built Around Three Main Castings—Motor Car Construction Closely Followed

By W. F. Bradley



Fiat kerosene farm tractor showing the use of three main castings and the elimination of any frame. The engine is an exceptionally clean design. The power pulley is at the rear end of the gearset

TURIN, ITALY—Special Correspondence—It is an open secret that numbers of European automobile concerns will jump into the tractor field as soon as circumstances permit. The first to come out openly in this line is the Fiat Co. of Turin, whose production will be examined with interest not only on account of its intrinsic merit, but because the firm back of it has secured the position of the biggest purely automobile factory in Europe.

In laying out this tractor, the Fiat company appears to have been governed by

local conditions, which are of a most diversified nature. These run all the way from immense plains with hardly a pimple on them to little patches of land on the mountain side only accessible with great difficulty by anything on wheels.

The machine is of the four-wheel tractor type, with motor in front, front end suspended, rear end without springs and drive to the rear wheels by means of overhead worm and live axle. One of the outstanding features of this machine is that there are no frame members. Instead there are three main castings: an

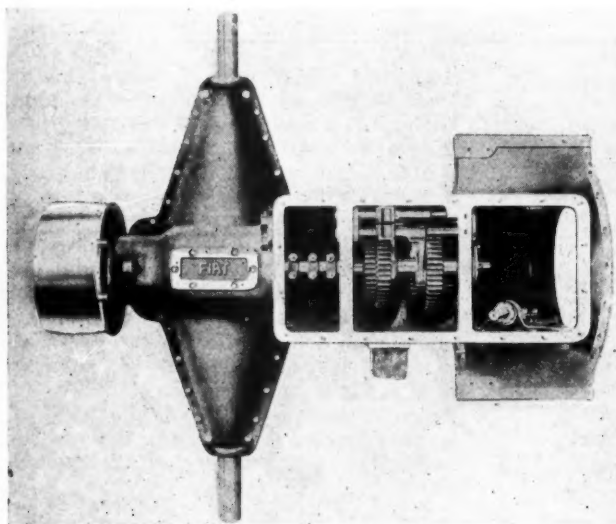
upper and lower half engine base, and a combined clutch, transmission and rear axle housing, this latter being bolted to the former, thus making what is virtually a one piece housing for the entire power plant and transmission.

The motor is the Fiat 3½-ton truck type, and although interesting, there is nothing new in its design, for it is a type which has been built in thousands for trucks supplied to all Allied armies. The cylinders are a 4-cylinder monobloc L-head casting of 100 by 180 mm. (3.9 by 7.08 in.) mounted on a horizontally divided cast-iron base. The magneto is driven off a transverse shaft, with the pump at the opposite end of the same shaft. Big aluminum inspection plates are bolted on the sides of the basechamber. Lubrication is under pressure to the three main bearings, the connecting rods and the wrist pins.

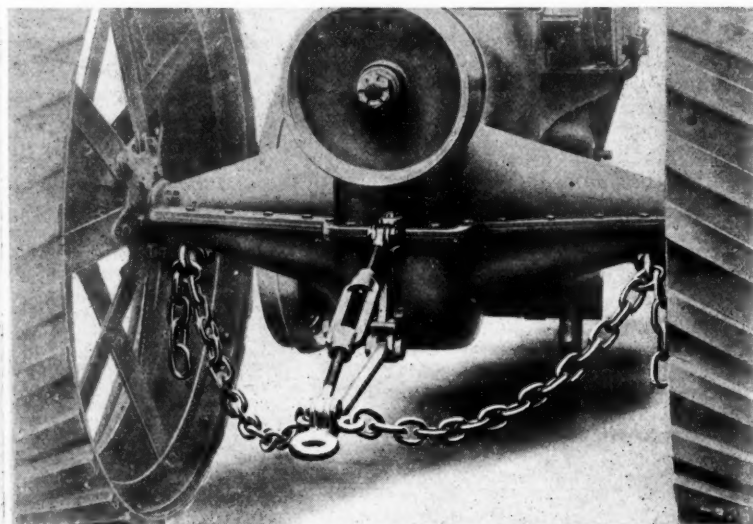
The carburetor is a Fiat type, as used on the trucks, bolted up to the right side of the cylinder casting and delivering its mixture through an integrally cast manifold. All the air is drawn in through the valve stem chamber, which is enclosed and fitted with wire gauze strainers for the admission of air. A special heating apparatus is fitted to the carburetor, enabling it to handle kerosene, which is the fuel generally used.

Gasoline is employed for starting only, and the small gasoline tank is carried inside the main kerosene tank mounted on the metal dash. A centrifugal governor limits the motor speed to 1100 r.p.m. Cooling is by means of a tubular radiator with bolted together header and base tanks; the cooling is assisted by a four-blade belt-driven aluminum fan.

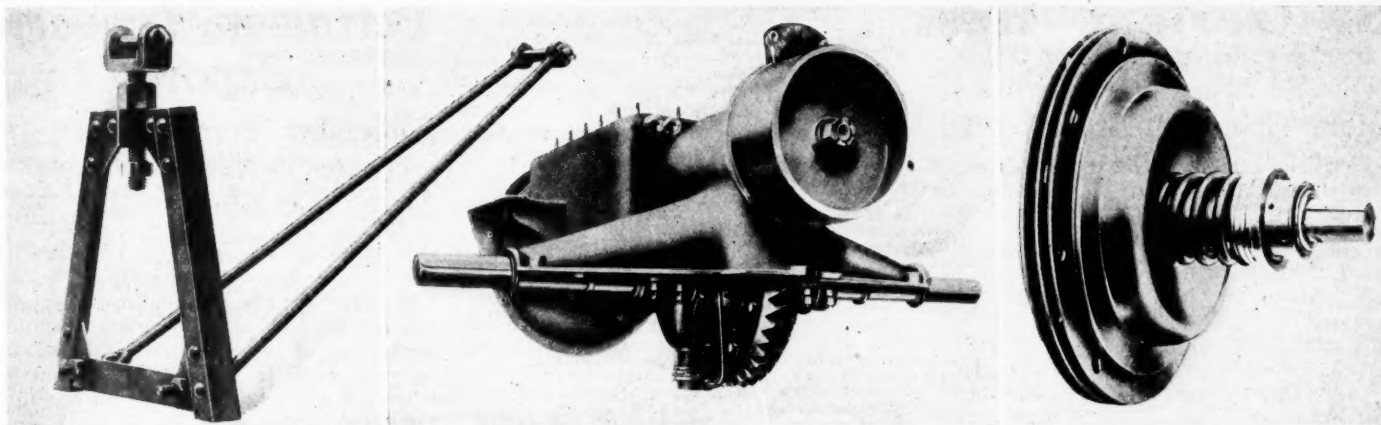
In the second housing, which is bolted up to the engine basechamber, are contained a multiple disk clutch, the worm and sector steering gear, a three speed and reverse selective transmission and finally an overhead worm and worm wheel. The upper portion of this housing over the clutch, steering gear and transmission is removable for inspection purposes. Although one and the same casting, the rear axle housing is divided



The single casting which serves to house the transmission mechanism, rear axle and steering gear



Rear axle, drawbar attachment and arrangement of the power pulley on the Fiat agricultural tractor



Permanent adjustable jack for removing one rear wheel to expose the power pulley

Fiat transmission mechanism in detail showing the mounting of the worm wheel and power pulley and the arrangement of the gear lubricating pump

Type of easily adjustable disk clutch used on the Fiat tractor

horizontally, the lower portion, which is attached to the upper by a series of bolts, being removable without in any way interfering with the axle. This gives complete accessibility to the worm wheel and the drive shafts. On the top of the housing there is an inspection cover immediately above the worm.

The rear wheels are built-up metal type of 51 in. diameter by 12 in. in width attached to the drive shafts by cone and key and made detachable. At the extremity of the worm shaft there is a 14-in. diameter pulley, with face width of 6½ in. This also serves as a brake drum with internal shoes. The big diameter wheels makes it impossible to use the drum. Thus a permanent adjustable jack is mounted under the axle, and after this has been lowered one of the wheels is withdrawn, making the pulley available for belt connection to any stationary machinery.

Spherical ball bearings are employed in the transmission, while the rear axle shafts are carried in bronze bushes, the lubrication of the entire rear axle being by pressure from a pump driven off the worm wheel.

The front of the tractor is suspended by a transverse inverted semi-elliptical spring. Automobile type steering is made use of, as on Fiat trucks, with the transverse tie bar in front of the axle. The only peculiarity is that the steering gear is inside the clutch housing. No wood is made use of in the construction of the tractor. There is a single seat, spring mounted on a steel column; ignition point is fixed, and throttle control is on one side of the metal cowl surrounding the fuel tank. The only instrument is a pressure indicator for the oil mounted on the top of the dash.

Rear wheels have a diameter of 51 in. and are fitted with detachable strakes. As these wheels are detachable, it is interesting to note that they weigh 600 lb. each, with the strakes. The front wheels, which are of same type as those at rear have a diameter of 32 in. and a width of 5 in. Total weight of the tractor is 5300 lb. Its maximum speed is 3.7 m.p.h.; on second gear speed is 2.1 m.p.h., and on bottom the tractor makes 1.2 m.p.h.

This tractor has already been submitted

to public trials in Italy, where it gave a very good account of itself. It operated on very heavy ground with three plows at an average speed of 2.4 m.p.h., when the average tractive effort was 2600 lb. On a very difficult portion of the ground the tractive effort was increased to 4600 lb. without the tractor showing any inclination to stall. The rate of plowing was 4550 sq. yd. per hr. to a depth of 7.8 in. Hauling an Osborne reaper and binder the tractor traveled at the rate of 3.7 m.p.h. and covered an area of 8370 sq. yd. in the 60 minutes.

Republic Truck Earns \$985,084

ALMA, MICH., Oct. 28—Earnings of the Republic Motor Truck Co. for the year ending June 30 were \$985,084; the Torbensen Axle Co. earned \$368,218 in the same period. These figures are after setting aside \$900,000 for excess profits and income taxes. Net sales of the Republic company totalled \$20,522,380, with manufacturing costs \$17,749,549, leaving a gross profit of \$2,772,831. The net profits, before deduction for taxes, amounted to \$1,485,083. Torbensen net sales were \$4,828,216 and the manufacturing costs \$3,750,012, leaving gross profits of \$1,064,115. The net profit before deductions for taxes was \$768,219.

INCOME ACCOUNT

Net sales	\$20,522,380
Manufacturing cost, etc.....	17,749,549
Gross profit	\$2,772,831
Other income	166,407
Total income	\$2,939,238
Expense and interest charges.....	1,454,155
Net profits	\$1,485,083
Preferred dividends	70,000
Balance	\$1,415,083
Previous surplus	1,304,081
Total surplus	\$2,719,164
Provision for war taxes.....	735,689
Exp. common stock issue written off	115,415
Profit and loss surplus.....	\$1,868,060
The balance sheet of the Republic Motor Truck Co., Inc., as of June 30, 1918 (including Republic Motor Truck Co. of California), shows as follows:	

ASSETS

	1918	1917
Plant, equipment, etc..	\$1,786,216	\$1,734,879
Investment	1,409,111	
Inventories	6,096,417	4,541,971

Accounts receivable ...	668,352	581,518
Due from officers and employees		17,794
Notes receivable	35,314	13,347
Customers' def'd notes	116,281	51,959
Liberty bonds	36,175	3,160
Cash	421,460	441,035
Deferred charges	102,923	16,804
Total	\$10,672,249	\$7,402,467

LIABILITIES

Preferred stock	\$1,000,000	\$1,000,000
Common stock (no par value)	3,612,514	1,007,455
Mortgage payable by Cal. Co.	100,000	
Capital liabilities subd. company		726,500
Notes payable	700,000	770,000
Accounts payable	1,632,941	2,087,948
Accrued payrolls	69,873	88,898
Accrued commissions, bonuses	115,500	71,032
Accrued local taxes....	84,992	42,955
Dealers' deposits	41,864	94,009
Due to Torbensen Axle Co.	946,505	
War tax provision	500,000	
Surplus	1,868,060	1,513,669
Total	\$10,672,249	\$7,402,467

Flies 4000 Miles in Zigzag Course from Gulf to Great Lakes

WASHINGTON, Oct. 29—Four thousand miles in the air in a zigzag course from the Gulf to the Great Lakes is the distance traveled by an Army flyer from Ellington Field near Houston, Texas, to Mt. Clemens, Mich. and return. The total hours of actual flight was 64. Nine days elapsed from the time he left Ellington Field until his return. Lt. John E. Davis was the pilot and he made the trip alone without mechanic and without changing plane or engine. He carried an extra gasoline tank in his plane, making the total capacity 50 gal.

Starting Friday at 1 p. m., Lt. Davis made Dallas for the night. From Love Field, Dallas, he flew to Memphis. Sunday at 8 p. m. he made Indianapolis by following the Mississippi north to St. Louis and swinging east by way of Springfield and Rantoul, Illinois. Here he was forced to take the ground in the dark without landing lights. The next morning he flew to Cincinnati and the day following to Mt. Clemens, Mich., by way of Dayton.

Switzerland Has 6140 Vehicles

More Than Half Are Imported
—Of Total, 4934 Are Cars
and 1206 Trucks

NEW YORK, Oct. 7—At the end of 1917 there were 6140 motor vehicles in Switzerland, of which number 4934 were touring cars and 1206 motor lorries. Of the total, 2565 motor cars were of Swiss origin and 3575 were imported vehicles.

According to these statistics, for which the Automobile Club of Switzerland is responsible, there were 15 motor car firms in the Helvetic confederation. The number of foreign makes represented in that country is 43. The foreign firm having the largest number of cars in service in Switzerland is Fiat with 283 touring cars and 15 motor lorries. Although it is an Italian firm which heads the list with a big margin, France is first in the list of nations, with Germany second, America third, Italy fourth, and Belgium fifth. British built cars are not listed separately.

The following are the detailed figures, showing the number of cars according to make and country of origin:

MOTOR VEHICLES IN SERVICE IN SWITZERLAND AT THE END OF 1917

Make and Country	No. of cars	No. of lorries
Switzerland		
Arbenz	5	87
Automobilwerke	2	74
Ajax A. G.	37	5
Berna	9	206
Clem Stella	58	14
Fischerwagen	89	10
Martini	635	77
Moser	16	..
Orion	6	70
Piccard-Pictet	428	20
Saurer	54	261
Sigma	92	2
Soller	..	2
Tribelhorn	112	57
Turicum	90	12
Others with less than 15 cars	20	15
	1653	912

Germany	No. of cars	No. of lorries
Adlerwerke	82	9
Benz	95	26
Bergmann	17	1
Loreley	25	..
Mathis	51	..
Mercedes	86	5
N. A. G.	27	5
Nekarsulm	15	..
Opel	143	13
Piccolo	25	1
Stoever	92	1
Others with less than 15 cars	104	10
	762	71

France	No. of cars	No. of lorries
Berliet	53	16
Brasier	65	18
Charron	42	2
Chenard & Walcker	29	1
Clement-Bayard	92	13
Cottin & Desgouttes	54	2
Darracq	20	9
De Dion Bouton	27	4
Delahaye	84	12
La Buirez	44	14
Mors	20	..
Panhard & Levassor	26	5
Peugeot	220	11
Renault	221	35
Lorraine-Dietrich	25	4
Rochet-Schneider	125	10
Unic	25	6
Zebre	15	..
Zedel	175	2
Others with less than 15 cars	155	15
	1375	160

Belgium	No. of cars	No. of lorries
F. N.	78	4
Minerva	98	1
Others	2	..
	178	5
Italy	No. of cars	No. of lorries
Blanchi	94	8
Diatto	18	..
F.I.A.T.	283	15
Itala	29	4
Scat	24	2
Other firms with less than 15 cars	38	6
	486	35
America	No. of cars	No. of lorries
Buick	24	..
Ford	143	3
Hupmobile	29	..
Oldsmobile	2	..
Studebaker	34	1
Willys-Overland	24	..
Other makes	49	3
Make not indicated	175	16
	480	23

Exports to Russia

WASHINGTON, Oct. 19—Applications will now be considered by the War Trade Board for the exportation of all commodities to Russia. A limited amount of cargo space will be available for shipments from the Pacific Coast direct to Vladivostok, and in allocating the space preference will be given to material covered by licenses issued on and after October 7, 1918, under conditions which the War Trade Board in Washington will define and discuss with exporters. Due consideration will be given to each particular transaction. In order to facilitate the consideration of applications, exporters are requested to state definitely on each application if the material is made up and ready for shipment and if so, its present location.

U. S. Wants Tire Tape

WASHINGTON, Oct. 25—The Post Office Department has asked for bids for ¾-in. tire tape in ¼-lb. rolls for use on Government-owned motor trucks. If the price does not hold good for the present fiscal year, the bidder is required to state the period of time it will hold good.

Cleveland Galvanizing Changes Name

CLEVELAND, Oct. 30—Chain Products Co. is the new name of the Cleveland Galvanizing Works Co. There have been no changes in the personnel or management of the company.

Petroleum Products Exports

September Figures Show Increases in All Items Except Lubricating Oil

WASHINGTON, Oct. 28—A study of the figures covering exports of petroleum products for the month of September last and for the nine months ending September of this year indicate a steady increase both in quantities and values, with the solitary exception of a slight reduction in the quantity of lubricating oil shipped abroad.

Taking the entire group of mineral oils as a unit, our exports for September, 1918, show an increase of 31.4 per cent as compared with September, 1917. Comparing the respective values, the increase is much more marked, it being no less than 80.2 per cent for the period in question.

A comparison of the exports by groups for the 9 months ending September, those for this year show substantial increases both in quantities and values.

Taking the gasoline and naphtha group alone for this 9-months period, the 1918 figures show an increase of 44.4 per cent in quantity and 64.9 per cent in value. Although the quantity of lubricating oil exported shows a slight reduction, its value for the 9 months of 1918 has increased by over 46 per cent.

Bus Line for Tokio

TOKIO, JAPAN, Aug. 15—An extensive motor bus service is to be started in Tokio by Dec. 1 for both freight and passenger traffic. Eventually the service will be maintained by 180 passenger cars, each carrying 16 persons, and by fifty motor trucks for freight. The passenger fare will be 4½ cents with an extra half cent for transfers if needed. The route of the motor bus system will follow the principal street car lines of the capital of Japan. The company announces it is planning to buy the initial fleet of motor buses from American manufacturers by Oct. 1. Later the company will build its own buses at Tokio.

Exports of Petroleum Products for Nine Months of 1918

	SEPTEMBER		NINE MONTHS ENDING SEPTEMBER	
	1918	1917	1918	1917
EXPORTS BY GROUP				
Mineral oils, gal.	263,841,657	200,687,535	2,090,563,381	1,896,220,077
Mineral oils, value	\$30,304,963	\$16,809,054	\$257,775,115	\$171,740,585
EXPORTS BY PRINCIPAL ARTICLES				
Crude mineral oil, gal.	21,525,770	10,827,854	154,075,661	119,332,065
Crude mineral oil, value	\$1,265,096	\$464,615	\$8,732,039	\$5,308,555
Lubricating oil, gal.	18,654,347	20,429,365	194,411,398	199,986,249
Lubricating oil, value	\$6,393,658	\$4,096,455	\$56,025,872	\$38,361,187
Gasoline, naphtha, etc., gal.	44,994,857	20,050,699	422,615,927	292,645,681
Gasoline, naphtha, etc., value	\$10,886,906	\$4,643,432	\$104,412,097	\$63,377,146

Plan Chicago-New York Airplane Mail Service

WASHINGTON, Oct. 28—The New York-Chicago air mail route will start between Dec. 1 and Dec. 15, according to an announcement made here by Postmaster General Burleson. The city of Cleveland has established Woodland Hills Park as the air mail field and will construct a hangar costing \$10,000. Chicago has given the use of Grant Park as an aviation field, and the Aero Club of Illinois has tendered the use of Ashburn Field for hangars, workshops and bunk houses for the mechanical forces. The Chicago Association of Commerce has appropriated \$15,000 for the construction of the air-mail hangar. Bryan, Ohio, the intermediary stopping point between Chicago and Cleveland, has furnished the Post Office Department with suitable ground and hangar.

The New York-Chicago route will be laid out in 3 legs, the first from New York to Bellefonte, Pa., a distance of 215 miles, with an emergency station and machine midway at Lehigh; the second leg from Bellefonte to Cleveland, a distance of 215 miles, with an emergency station at Clarion, Pa., a distance of 87 miles from Bellefonte; the third leg from Cleveland to Chicago, a distance of 323 miles, with an intermediate mailing station at Bryan.

The plan of operation during the unfavorable winter months contemplates the airplanes leaving Chicago and New York at 6 o'clock each morning, with a capacity of about 20,000 letters, and making the trip, including all stops, within a period of 10 hours.

103 Planes Bomb Los Angeles

WASHINGTON, Oct. 28—One hundred and three airplanes leaving March Field, Riverside, Cal., in battle formation made a flight of 160 miles without accident. This large squadron bombed Los Angeles with Liberty Loan literature. The total mileage of the trip was 16,000, made without a fatality or the loss of a plane. Accompanying the air fleet was a hospital plane and another plane carried an official photographer, who made moving pictures while en route. This is the largest number of planes that ever visited an American city. All of the planes were of the Curtiss JN-4D training type. Approximately 3000 gal. of gasoline were consumed.

Chicago-Denver Airplane Mail

WASHINGTON, Oct. 25—The aerial mail service operated by the Post Office Department will be extended immediately after the war to include a route between Chicago and Denver, with a possible extension to San Francisco.

Five Aviation Fatalities

WASHINGTON, Oct. 28—During the week ending Oct. 19 there were reported five fatalities in aviation training fields in the United States. Two deaths oc-

curred at Payne Field, West Point, Miss., and there was 1 each at Carruthers Field, Benbrook, Tex.; Langley Field, Hampton, Va., and Post Field, Fort Sill, Okla. There were no deaths from flying accidents reported from any of the other 23 fields. Each death represents 3544 hours of flying, or 283,620 miles of air travel.

Godman Field in Kentucky

WASHINGTON, Oct. 28—The aviation field at Camp Knox, Stithton, Ky., has been named Godman Field in honor of First Lieutenant Louis K. Godman of the Air Service, who was killed in an airplane accident recently.

Hendee Profits \$645,225

NEW YORK, Oct. 28—During the fiscal year ending Aug. 31 the Hendee Mfg. Co., Springfield, Mass., earned undivided profits of \$645,225, as against \$1,142,250 during the previous year. At the same time good will, which last year was capitalized at \$8,300,000, is this year put down for \$7,000,000. Following is the condensed balance sheet comparing last year with this year:

Assets		
	1917	1918
Real estate, buildings, etc.	\$1,546,483	\$1,556,944
Good will	8,300,000	7,000,000
Investments	908,766	670,816
Inventories	2,562,713	3,083,085
Due from customers...	758,885	1,017,968
Due from branches...	102,729	234,380
Cash	171,100	171,127
	<u>\$14,350,676</u>	<u>\$13,734,320</u>
Liabilities		
	1917	1918
Common stock	\$10,000,000	\$10,000,000
Preferred stock	2,200,800	1,845,700
Due to trade creditors.	607,257	854,255
Pay roll accrued.....	35,652	54,057
Reserve for taxes, etc.	64,717	51,450
Reserve for pref. stock.	300,000	102,683
Undivided profits	1,142,250	645,225
Notes payable .....	.....	180,950
	<u>\$14,350,676</u>	<u>\$13,734,320</u>

Fordson Distributors Organize

PROVIDENCE, R. I., Oct. 28—The Fordson distributors of the United States are banded together in the Fordson Distributors Association of America, with headquarters of the organization in this city. The object of the association is to promote the interests of those concerned. The organization was formed in Des Moines in July. The officers are: President, Clyde L. Herring, Herring Motor Co., Des Moines; treasurer, Thomas J. Northway, Rochester, N. Y.; secretary, Harvey J. Flint, this city.

Revoke Tin Import Licenses

WASHINGTON, Oct. 25—Licenses heretofore granted for importation of tin have been revoked by the War Trade Board and all future imports will be granted only on licenses issued to cover shipments consigned to the United Steel Products Co.

Glenn Martin Develops 180-M.p.h. Bombing Plane

WASHINGTON, Oct. 28—A bombing plane designed by Glenn Martin which is said to have developed a speed of 180 m.p.h., is receiving the attention of both the Senate Military Affairs Committee and the Bureau of Aircraft Production. This plane was mentioned in conference between the members of the War Department and the committee late last week. There have been rumors here that there was a new high-powered plane designed, and that it would supersede the Handley-Page and Caproni in our program. Although the report of a new plane has been confirmed in the acknowledgment that Mr. Martin has designed one, nothing definite can be learned at this time regarding its superiority over the Caproni or Handley-Page.

At the conference between the War Department and the committee officials it was said that the Caproni had passed the various tests satisfactorily. The committee was also informed that 2000 airplanes have been shipped to France.

Department of Labor Wants Cars

WASHINGTON, Oct. 28—The Department of Interior asks for bids for three 5-passenger cars. Bids should be submitted to the United States Indian Service, Rosebud, South Dakota, before Nov. 6, 1918. Illustrations should be submitted with full specifications, and each bid amounting to more than \$500 must be accompanied by a certified check or draft equal to 5 per cent of the amount involved.

Shipping Mobile Laundry Units

WASHINGTON, Oct. 28—Twenty-six mobile laundry units have been shipped overseas and manufacturers are now making shipments at the rate of about four per week. Each mobile laundry unit consists of a steam tractor, four trailers which carry the laundry machinery and equipment, and one supply truck. The steam tractor hauls the laundry unit to the point where it operates and then furnishes steam and power for the four trailers, which constitute the laundry. The arrangement of the units permits their disassembly and movement to a new location 30 minutes after the laundry ceases to operate.

Complaints Against Accessory Concerns

WASHINGTON, Oct. 25—The Federal Trade Commission has issued complaints against the Baltimore Hub-Wheel & Mfg. Co. and the Holland-Baden-Ramsen Co., both of Baltimore, because, according to the complaint, these concerns for more than 2 years have "sought to induce and compel manufacturers to refuse to recognize certain competitors as jobbers or wholesalers and as entitled to the benefit of jobbers' or wholesalers' prices and terms. The concerns were cited to appear before the commission at Washington Nov. 29.

Aeronautical Experience Will Profoundly Affect Motor Car Practice

President of British Institution of Automobile Engineers Predicts No Return to Pre-War Designs—Necessity for Greater Standardization and More Research Work Paramount

LONDON, ENGLAND, Oct. 3.—Special Correspondence — Predicting that the automobile industry will never return to a pre-war basis, President A. A. Remington, of the Institution of Automobile Engineers, prophesied at the last meeting of that body that, without doubt, the valuable aeronautical experience which manufacturers have had as a result of the war will have a profound effect on automobile design after the war. There will be great changes in our automobile factories, and whereas the technical man in the engineering industry heretofore has been subordinate to the equivalent commercial man, it seems likely that these positions will be almost completely reversed.

Standardization and the necessity for a greater amount of research are of vital importance, stated Remington, and urged that the following researches be undertaken:

1—An investigation to establish the most economical application of the laws relating to conductivity, heat transference and diffusivity, as affecting motor car radiators, so as to enable the smallest or lightest radiator for a given case, to be determined, including amongst suitable proportions for the provision of air draft, the most suitable rate of air draft and the rate of flow of the water.

2—An investigation to determine the factors making for comfort in suspension—including inter-relations between such factors, as

- a—Vertical periodicity of the front and rear springs respectively in relation to each other.
- b—Rolling periodicity.
- c—Pitching periodicity.
- d—Metacentric height.
- e—Wheelbase.
- f—Weight distribution.

"It can now be seen that the war will vitally affect the conditions of industry in almost every direction," said Mr. Remington, "and it is impossible to think that at the end of the war, when our normal industry is reorganized, I might almost say re-started, we shall revert to pre-war ideals and methods, either in connection with commerce, manufacture or design. Much has happened during the course of the war to change our ideas on those, in common with other subjects, and without doubt the automobile industry will with most industries, and, in fact, it is to be hoped, with the country and the world in general, ultimately reap much benefit from these changes in idea and method.

"At times we hear the suggestion that no one will be able to afford motor cars after the war, and this argument is so persistently advanced that one is sometimes tempted to wonder what degree of truth there can be in such a statement. The motor car has long since developed from being solely a vehicle of sport, and

while it still suffers under the undesirable name of 'pleasure car' it is now recognized on all sides as essential means of transport for passengers as the lorry or motor van is for goods.

"After the war we shall doubtless suffer from severe taxation and high cost of living, but as the automobile is a time-saver, it seems that the adverse conditions of life will accentuate rather than diminish the necessity for it, and it will be more than ever a necessity and money-maker. Therefore, although high cost of living will mean high costs both for material and labor, the motor car business must and will flourish notwithstanding.

"The question of the types of vehicle for which there will be a market will have to be carefully considered; undoubtedly there will be in the future a market, and a large one, for the cheap car, but in the automobile industry, as in every other branch of life under normal circumstances, a man gets what he pays for; therefore, as long as proper value is given for money, as we have seen that there will be a big demand for cars for all purposes, it follows that there must be a market for every class of vehicle for which there was a market before the war. Naturally there may not be a market for the same proportion of vehicles in every category as there was before the war, but it will be necessary for the industry in organizing itself to proportion its output as a whole in such a manner that it will meet the needs of the buyers; a statement that is easily made, but it will probably involve a lot of hard thinking and possibly some bitter experiences, before the industry will have so adjusted itself to meet the needs of the public.

"It yet remains to be seen to what extent it will be policy for the automobile engineer to take advantage of his aeronautical engine experience. We are all aware that the aeronautical engine has a much higher mean effective pressure, higher mechanical efficiency and lower specific fuel consumption than even the most advanced pre-war automobile engine, but the requisite characteristics for the two classes of work are so different that while aeronautical engine experience can with advantage be used to some considerable degree in the automobile engine, it is difficult to say just how far results will warrant this utilization.

"But in my opinion much of the aeronautical engine experience that has been gained by our automobile engineers during the war will be found to have a profound effect on their post-war automobile productions, and an examination of the extent of this effect, when such a

course becomes possible, will be extremely interesting. I am looking forward to great strides in the development of automobile efficiency (using the term efficiency in its broadest sense of meaning more useful for its ultimate purpose) as a result of the war experience of British automobile engineers.

"In the past the technical man in the engineering industry has always been subordinate to the equivalent commercial man, perhaps because it was supposed that the technical knowledge could be obtained from books, whereas so-called commercial knowledge was composed of some indefinable sort of rare instinct coupled with experience; but it is not difficult to discern that the change is taking place, and it is certain that in years to come the technical positions will cease to be subordinate in the same way as formerly. The application of more and more science to all branches of business, by increasing the necessity for scientific knowledge, will render such knowledge more general; also in future the workshop trained man who has had no real scientific training will, because of the more general existence of scientific knowledge, no longer be able to pose as scientific. The requirements of the higher positions on the scientific side of industry will necessitate the employment of many more highly-trained scientists to fill them, and it is to be hoped that ultimately all management positions in our engineering industries will be filled by men possessing scientific knowledge as well as business experience.

"The war has been the means of causing almost every British pre-war motor car factory to be greatly enlarged, and it is therefore to be expected that after the war the output of each factory in this country will be greatly increased, and this will mean that greater standardization will not only be possible, but profitable. It is therefore highly desirable that we should all, in our mutual interests, do everything we can to forward the work of standardization for the automobile industry.

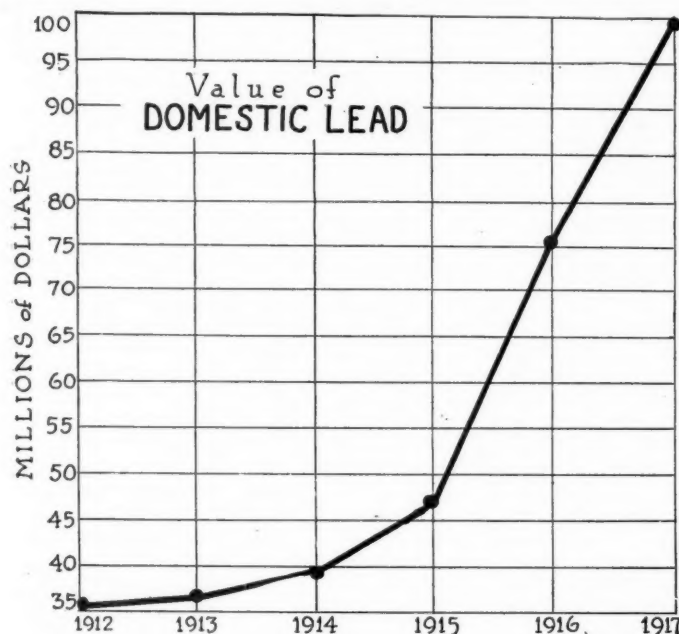
"It is probable that the examination of post-war models will, as previously referred to, show that the motor car engine has absorbed a lot of the practice that has been developed for the immediate advantage of its sister—or shall I say child?—the aeronautical engine. It must be considered, however, that the requirements of the aeronautical engine, apart from the necessity for lightness, partake more of the character of the marine than of the motor car engine, although the development of power-weight ratio in aeroplanes, resulting in more rapid climb and greater altitude with its consequent reduction in atmospheric pressure, now practicable for regular flying, is bringing the conditions of operation of the aeroplane engine into closer analogy with the conditions that obtain for the motor car engine."

The Crompton medal, which is awarded annually by the institution for the best paper, has been awarded to Major H. P. Philpot for his paper on "Some Experiments on Notched Bars."

AUTOMOTIVE MATERIALS MARKETS

Materials Market Prices

Acids		Surlap:	
Muriatic, lb.....	.02 -.03	8 oz., yd.....	12.4 -15.85
Phosphoric (85%)..	.35 -.39	10½ oz., yd.....	14.6 -18.6
Sulphuric (60), lb..	.008	Copper:	
Aluminum:		Elec., lb.....	.26
Ingot, lb.....	.33	Lake, lb.....	.26
Sheets (18 gage or		Fabric, Tire (17½ oz.):	
more), lb.....	.40	Sea Is., combed, lb.	1.65-1.70
Antimony, lb.....	.13 -.13½	Egypt, combed, lb.	1.25-1.35



Although the production of lead from domestic ores decreased in 1917, its value advanced from \$76,000,000 to \$99,000,000

Egypt, carded, lb..	1.20-1.30
Peelers, combed, lb.	1.05-1.20
Peelers, carded, lb.	.95-1.05
Fibre, (¼ in. sheet base), lb.....	.50
Graphite:	
Ceylon, lb.....	.07½-.25
Madagascar, lb.	.10 -.15
Mexican, lb.....	.03½
Lead, lb.....	.08 -.09
Leather:	
Hides, lb.....	.18 -.35½
Nickel, lb.....	.40
Oil:	
Gasoline:	
Auto., gal.....	.24½
68 to 70 gal.....	.30½
Lard:	
Prime City, gal..	2.50
Ex. No. 1, gal....	1.70
Linseed, gal.....	1.61-1.62
Menhaden (Brown), gal.	1.30-1.31
Petroleum (crude), Kansas, bbl.....	2.25
Pennsylvania, bbl.	4.00

Rubber:	
Ceylon:	
First latex pale crepe, lb.....	.60½
Brown, crepe, thin, clear, lb.....	.53
Smoked, ribbed sheets, lb.....	.58½
Para:	
Up River, fine, lb.	.64
Up River, coarse, lb. ....	.36½
Island, fine, lb..	.55
Shellac (orange), lb.	.74 -.75
Spelter .....	.09 -.09½
Steel:	
Angle beams and channels, lb.....	.03
Automobile sheet (see sp. table).	
Cold rolled, lb....	.06½
Hot rolled, lb.....	.03½
Tin .....	.76½-.77½
Tungsten, lb.....	2.45-2.50
Waste (cotton), lb..	.12½-.17

AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only Per 100 lbs.	Primes when seconds up to 15 per cent are taken Per 100 lbs.
Automobile body stock.....	\$5.95	\$5.85
Automobile body stock, deep stamping.	6.20	6.10
Automobile body stock, extra deep stamping	6.45	6.35
Hood, flat fender, door and apron, or splash guard stock.....	6.05	5.95
Crown fender, cowl and radiator casing, deep stamping.....	6.30	6.20
Crown fender, cowl and radiator casing, extra deep stamping.....	6.55	6.45
Automobile Sheet Extras for Extreme Widths:		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
Black Sheet Extras to Apply to Narrow Widths:		
Oiling, 10c. per 100 lb.		
Patent leveling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.		

Bituminous Output Affected by Epidemic

Both anthracite and bituminous coal suffered a setback during the week ended Oct. 19, owing to the epidemic of influenza in the mining regions. The 11,523,000 net tons of soft coal produced in the week under review, though 800,000 net tons behind the output of the week ended Oct. 12, exceeded by 1,300,000 net tons the production during the same period of 1917. Reports show that influenza caused a decrease in the shipments of soft coal from all fields except western Pennsylvania. The epidemic has not helped the anthracite situation. Production of hard coal during the week ended Oct. 19 totaled 1,715,000 net tons compared with 1,955,000 net tons the preceding week. The total output of anthracite from April 1 to date is estimated at 57,573,000 net tons, as against 56,736,000 net tons for the same period of 1917.

Though the country as a whole is rather well supplied with bituminous coal, the necessity still exists for the exercise of the strictest economy. The quantity of anthracite distributed so far this year to those sections which are permitted to burn hard coal is greater than in normal

years. The demand for domestic sizes, however, shows no signs of a let-up.

Prepared sizes of anthracite, such as egg, stove and chestnut, are scarce. Many consumers have been advised to purchase the smaller sizes, and mix it with the larger grades. The small sizes of anthracite are plentiful and several shippers have been cutting the prices to move surplus stock.

Summed up concretely, the coal situation can be said to be generally satisfactory. There is no prospect of a serious shortage in bituminous, and the belief is expressed that domestic consumers will receive their share of anthracite before November closes.—*Coal Age*.

Build Experimental Ruby Tractor

EAU CLAIRE, WIS., Oct. 28—The United States Switch Co., Eau Claire, Wis., manufacturing automatic railroad signals and switch units and motor railroad tractors, is completing work on an experimental model of a large farm tractor for the Ruby Tractor Co., Minneapolis. The tractor will weigh about 7½ tons, a single casting used in its construction weighing 1671 lb.

Federal Taxicab for Washington

WASHINGTON, Oct. 28—A federal taxicab service under the operation of the Motor Transport Corps will be inaugurated here this week for the special benefit of army officers. It is designed to facilitate the transportation of officers between the various Government departments, to expedite Government business and at the same time to save money.

War Service Members Meet

WASHINGTON, Oct. 28—More than 300 industrial war service committees will meet at Atlantic City Dec. 4, 5 and 6, under the auspices of the War Service Executive Committee, Chamber of Commerce of the United States. The meeting will bring together about 3000 industrial leaders to discuss industrial war problems. A more centralized scheme of organization will be one of the topics.

La Crosse Tractor Price Advances

LA CROSSE, WIS., Oct. 31—The price of the La Crosse Happy Farmer tractor has been advanced from \$975 to \$1,150, the new price to be effective Nov. 1. This applies to both the models, F and B

Sheldon Building New Shop

NEW YORK, Oct. 28.—Rapid progress is being made in the erection of the new Sheldon all steel and concrete, two-story machine shop which is expected to increase production at least 30 per cent. The floor area will be 85,152 sq. ft., which is about twice the floor space of the present machine shop. It is expected that the new building will be completed by January 1, and partly in operation about the same time as the machinery is being installed as the building is being erected. Only machining of axle parts will be handled in the new building.

Templar 90 Per Cent War Work

CLEVELAND, Oct. 25.—The Templar Motors Corp. is at present on a 90 per cent war basis, manufacturing a large order of 155 m.m. shells. The company is producing a few cars each month, and has enough material on hand to build several hundred more cars. The Templar plant is being greatly enlarged by the addition of two more stories on the present building, which is 500 by 72. This is in addition to several smaller one-story buildings, and when completed will triple the capacity of the plant.

McDole Increases Capacity

KALAMAZOO, MICH., Oct. 25.—C. B. McDole is preparing to increase the capacity of his sheet metal plant by the installation of another large press, also other equipment for the manufacture of automobile truck fenders. In addition to the large orders already secured, he has also been urged to bid on several contracts for the Emergency Fleet Corp.

To Make Propeller Material

HAYWARD, WIS., Oct. 28.—The American Veneer Co. has been organized at Hayward, Wis., with a capital stock of \$100,000, and will erect and equip a new plant for the manufacture of airplane veneers, propeller material, gun stocks and similar hardwood products for military and naval purposes. George C. Glover, head of the Willow River Lumber Co., Hayward, is president and general manager of the new concern.

Matthews to Make Propellers

MILWAUKEE, Oct. 28.—The Matthews Bros. Mfg. Co., 65-75 Fourth Street, Milwaukee, a large maker of office furniture and interior finish, has been awarded a Government contract for 200 airplane propellers of a new type and for 25 pontoons for seaplanes.

To Train Tractor Operators

MADISON, WIS., Oct. 28.—A special course of training in farm tractor construction, maintenance and operation will be given Dec. 2 to 21 by the agricultural engineering department of the University of Wisconsin at Madison. The course is open to women as well as men, and no limit of age will be set. The number of students in the three weeks' course is limited to 50, and as indications already are that there will be an overflow, it is

Current News of Factories

*Notes of New Plants—Old
Ones Enlarged*

planned to repeat the course early in January. The course will be directed by F. W. Duffee and E. C. Suave, and tractor men of national reputation will give lectures.

Exportation of Second-Hand Articles

WASHINGTON, Oct. 28.—On and after Nov. 1 applicants for licenses to export second-hand articles composed of iron or steel will be required to state on Form X that the commodity to be exported is "second-hand." Failure on the part of the applicant to describe second-hand material as such will be regarded as an inaccurate description of the goods and the applicant will be subject to the prescribed penalty therefor.

Canadian Johns-Manville Company

MONTREAL, Oct. 23.—The Canadian Johns-Manville Co., Limited, has been formed here with a capital stock of \$2,500,000.

Capital Increases

The Lansing Forge Co., Lansing, Mich., has increased its capital stock from \$100,000 to \$300,000.

The American Machine Products Co., Detroit, has increased its capitalization from \$10,000 to \$40,000.

Dividends Declared

National Acme Co., Cleveland, quarterly cash dividend of 1½ per cent (or 75 cents a share), payable Nov. 30.

Cleveland Automatic Machine Co., Cleveland, a dividend of 1½ per cent on common stock, par of which is \$50, payable Nov. 26.

Pressed Steel Car Co., Cleveland, quarterly dividend of \$2 a share on the common stock, payable Dec. 4; also regular quarterly dividend of \$1.75 on preferred, payable Nov. 26.

Auto Investment Co., Detroit, initial dividend of 4 per cent, payable Nov. 1.

Michigan Drop Forge Co., Pontiac, has declared the monthly dividend for October of 15 cents per share and an extra dividend of 10 cents per share on common stock.

Canadian Agent for Pasco Wheels

BUFFALO, Oct. 28.—The Northern Electric Co. has been appointed Canadian agent for Pasco wire wheels and will handle them in all its Canadian branches.

Auction Smith Truck Assets

CHICAGO, Oct. 29.—The assets belonging to the estate of the Smith Motor Truck Corp., which was declared bankrupt in August, will be sold at auction by Samuel L. Winternitz & Co. at Clearing, Ill., Nov. 15. The inventory value is placed at \$1,000,000 and the assets to be sold include \$150,000 of standard hardware and 2000 tons of cast iron, malleable gray iron, steel machine cast forgings and castings, 200 tons of 1 15/16-in. shafting, 50,000 13 to 24-in. steel sprocket blanks, etc. Included in the specialties for Fords listed in the sale are 10,000 vanadium steel axles in the rough. A large stock of tractor parts will be auctioned off also together with fixtures, etc.

Moller & Schuman Becomes Hilo

BROOKLYN, N. Y., Oct. 28.—The Moller & Schuman Co., paint and varnish maker, has altered its corporate style to Hilo Varnish Corp. The personnel of the company remains unchanged.

Milwaukee Ford Branch Locates

MILWAUKEE, Oct. 26.—The Milwaukee branch of the Ford Motor Co. has leased a building with 40,000 sq. ft. of floorspace from the Val. Blatz Brewing Co. for a period ending one year after the close of the war, for the accommodation of its parts, service, warehouse and office departments during the time the Government occupies the Milwaukee assembling plant as a hospital. The Ford company will vacate its building by Nov. 1. The temporary headquarters building is located at Market and Johnson Streets, in the downtown district of Milwaukee. It formerly was used as a cooper shop by the Blatz brewery. The annual rental is \$10,000.

Grand Rapids Brass Enlarging

GRAND RAPIDS, Oct. 26.—The Grand Rapids Brass Co. will increase its capitalization by \$75,000. The company has at the present time six Government contracts, totaling several hundred thousand dollars, which will take about 70 per cent of the manufacturing capacity of the company. Other orders are expected to be received, and it is believed that for the fiscal year 1918 the company's total business will amount to about \$1,000,000. The company owns plants in Grand Rapids and Lansing and employs about 400 men.

May Not Take Boston Buildings

BOSTON, Oct. 26.—There is a hitch in the plans to take over all the motor buildings on Commonwealth Avenue and now it begins to look as if the dealers will not have to go scurrying about for places. Rear Admiral Wood, who has charge of the First Naval District, approved of the plan, and he was anxious to house the sailors there for the next eight months. But when officials of the Navy Department went over the figures submitted by the Boston dealers the cost seemed too high.

Kirkpatrick in Motor Transport

NEW YORK, Oct. 28—Andrew Kirkpatrick, vice-president and secretary of L. V. Flechter & Co., has resigned to enter the Motor Transport Corps.

R. C. Greth has been appointed district representative of the Cleveland Tractor Co. in the Oklahoma territory. For the past 2 years he has been engaged in the automobile business in Phoenix, Ariz., prior to which he was associated with the Overland and Hudson companies as special representative.

U. B. McCurdy has been appointed district manager for the Cleveland Tractor Co., with headquarters at 1307 Waldheim Building, Kansas City. The territory which will be under the supervision of the Kansas City office comprises Kansas, Nebraska, Colorado and Wyoming, also portions of Missouri, Iowa and South Dakota.

M. M. Risberg has been appointed controller of the Republic Motor Truck Co., Alma, Mich., and the other concerns controlled by the Republic company—the Republic Motor Truck of California, the M. & S. Corp., Detroit, and the Torbensen Axle Co., Cleveland. W. G. Ralph will be Mr. Risberg's assistant.

Arthur Birge, who was manager of the Ames Tool & Shovel Co., Anderson, Ind., has succeeded R. F. Dyer as assistant sales manager of the Aluminum Castings Co., Detroit.

Howard Emery, who was manager of the Detroit plant of the Aluminum Castings Co. a few years ago, and later transferred to the managership of the Manitowoc plant, has returned to the Detroit plant to occupy the position of manager recently vacated by Charles B. Bohn.

A. H. Doolittle, formerly sales and advertising manager of the Zenith Carburer Co., Detroit, has joined the publication division, service department, Bureau of Aircraft, in Detroit.

Major H. O. Bernhardt, formerly production manager of the Pierce-Arrow Motor Car Co., and more recently factory manager of the Harroun Motors Corp., Wayne, Mich., has been promoted to the rank of lieutenant-colonel. He has recently completed an assignment at the plant of the Bethlehem Steel Co., Bethlehem, Pa., for the chief of ordnance, and comes to Detroit representing him as assistant district chief, assigned to the Ford plants at Highland Park and Dearborn.

Elmer H. Hohenthal, formerly associated with the Bosch Magneto Co. and the Simms Magneto Co., has been appointed manager of the Detroit sales and service branch of the Eisemann Magneto Co.

Men of the Industry

*Changes in Personnel and
Position*

Charles M. Smith, formerly associated with the Detroit Steel Castings Co. and with the Michigan Steel Castings Co., Detroit, has been appointed superintendent of the foundry operation by the Nelson Bronze Co., Saginaw, Mich.

E. M. Benedict has been appointed general manager of the Jackson Munitions Corp., Jackson, Mich. He comes from Toledo, Ohio.

Archibald Black, recently aeronautical engineer of the L-W-F Engineering Co., College Point, N. Y., has become aeronautical engineer with the Bureau of Construction and Repair, Navy Department, Washington, D. C., and began his duties there Oct. 21, 1918.

75,288,851 Tons Iron Mined in 1917

WASHINGTON, Oct. 28—Iron ore mined in the United States in 1917 totaled 75,288,851 tons, exceeding the 1916 output by 121,179 tons, according to a report issued here to-day by the Department of the Interior. The ore was mined in 25 States in 1917 and 24 in 1916, the greater part of the output coming from Minnesota, Michigan, Alabama, New York and Wisconsin. The imports of iron ore in 1917 were 971,663 tons as compared with 1,325,736 tons in 1916.

A total of 38,612,546 tons of pig iron, exclusive of ferroalloys, was shipped or used by producers in 1917, as compared with 39,126,324 tons in 1916, a decrease of 1.32 per cent. The production of pig iron, including ferroalloys, in 1917 was 38,647,397 tons in 1917, as compared with 39,434,797 tons in 1916, a decrease of 4.5 per cent.

1000 Liberty Engines Produced Weekly

WASHINGTON, Oct. 30—Production of Liberty airplane engines for October has reached an average of 1000 per week. This was the production hoped for by December. There are now 2500 fighting planes, not including single seaters, manufactured in this country and shipped abroad to the American Expeditionary Forces. These include 150 heavy bombers and other planes of all classes, such as observation and day bombing machines. It was stated here to-day that the production of aircraft has reached a point where it is limited only by facilities for transportation to France and that there are more American-made airplanes awaiting shipment at points of embarkation than can immediately be loaded.

Veteran Boston Dealer Dies

BOSTON, Oct. 26—Frederick S. Smith, one of the pioneer dealers in Boston, and who has handled the Mercer car, was buried here yesterday. He was another victim of the Spanish influenza pneumonia epidemic.

Charles T. Jeffery, Kenosha, Wis., who was president, general manager and one of the chief owners of the Thomas B. Jeffery Co., until the interest was acquired by the Nash Motors Co., has accepted a position as one of four superintendents of industrial relations for the Emergency Fleet Corporation. He will have charge of the Delaware River district, with headquarters in Philadelphia.

W. L. Romaine, secretary of the Badger-Packard Machinery Co., Milwaukee, has accepted the appointment of director of the division of oil conservation of the Fuel Administration for Wisconsin. This is a new position which has been created for the purpose of administration of rules and regulations affecting the use of fuel, lubricating and other oils, as well as gasoline and other petroleum products.

B. T. McDonald, manager of the Poughkeepsie (N. Y.) works of the Moline Plow Co., Moline, Ill., has temporarily been transferred to Stoughton, Wis., to take charge of the Mandt vehicle branch of the Moline company during the illness of George Ford. Mr. McDonald was general manager of the Stoughton plant before being placed in charge of the Poughkeepsie works.

Manganese in Utah

WASHINGTON, Oct. 28—Manganese ore reserves have been found in the Green River district of Utah, according to the Department of Interior, which has just completed an examination of this region. The investigations included a thorough examination of 20 manganese mines and a detailed survey of 4 square miles. The mines in this district are producing from 400 to 600 tons of manganese ore monthly and, according to the reports, there are at least 7300 tons of high grade ore still available for mining under present conditions and without modification of existing methods. In addition 22,500 tons, chiefly in the residual surface deposits, will be available under improved conditions or methods. Most of the ore in this district contains close to 4 per cent of manganese and is consequently a profitable mining venture.

Motor Transport Corps Insignia

WASHINGTON, Oct. 28—The Motor Transport Corps will use a purple hat cord to designate its enlisted men. The hat cords will soon make their appearance, although they are not likely to become common in this country, as the Motor Transport Corps is essentially an overseas organization and the men and officers both go to France shortly after completing their training courses.

Ordinance Department Contracts

WASHINGTON, Oct. 28—The following contracts were placed by the Ordinance Department:

Holt Mfg. Co., Peoria, caterpillar tractors.
Briscoe Motor Corp., Jackson, machining shells.
Four Wheel Drive Auto Co., Clintonville, chassis.
Nash Motors Co., Peoria, chassis.
Cadillac Motor Car Co., Detroit, motor spare parts.
The Sterling Motor Car Co., Washington, shells.
Nash Motors Co., Kenosha, miscellaneous truck equipment.

Quartermaster Corps Contracts

WASHINGTON, Oct. 28—The following contracts were placed by the Quartermaster Department:

Splitdorf Electric Co., electrical supplies, \$6,155.68.
B. F. Goodrich Rubber Co., tubes, \$3,050.
Fisk Rubber Co., casings, \$6,888.
Pantasote Co., New York, side curtain material, \$22,800.
B. F. Goodrich Co., casings and tubes, \$7,056.
H. W. Johns-Manville Co., motor parts, \$8,325.01.
Willard Storage Battery Co., storage batteries, \$8,778.60.
Goodyear Tire & Rubber Co., casings and tubes, \$7,090.30.

More Quartermaster Contracts

WASHINGTON, Oct. 21—Following is a list of contracts placed by the Quartermaster Depot of the Army:

Kelly-Springfield Motor Truck Co., motor parts, \$32,540.45.
Packard Motor Car Co., Detroit, motor parts, \$36,987.21.
Standard Oil Co. of California, cup grease and oil, etc., \$6,779.
Standard Oil Co. of Kentucky, gasoline, \$6,970.

Aircraft Production Contracts

WASHINGTON, Oct. 25—The following contracts have been recently placed by the Bureau of Aircraft Production:

Wright-Martin Aircraft Corp., New Brunswick, engine spares.
Hartzell Walnut Propeller Co., Piqua, generator propellers.
Howell & Lesser, San Francisco, airplanes.
Curtiss Aeroplane & Motor Corp., Buffalo, spares for planes.
Splitdorf Electrical Co., Newark, engine spares.
Splitdorf Electrical Co., Newark, magnetos and parts.
Firestone Tire & Rubber Co., Akron, balloon.
Splitdorf Electrical Co., Newark, engine spares.
Zenith Carburetor Co., Detroit, carburetors.
The Willys-Overland Co., Toledo, engine spares.
Wilson Foundry & Machine Co., Pontiac, engines spares.
Pittsburgh Model Engine Co., Pittsburgh, engine spares.
Wright-Martin Aircraft Corp., New Brunswick, tools.
Curtiss Aeroplane & Motor Corp., Buffalo, cylinders.
Stromberg Motor Devices Co., Chicago, engine spares.
Champion Ignition Co., Flint, spark plugs.
Silvex Co., South Bethlehem, spark plugs.
Gray & Davis, Boston, aero navigation lights.
B. V. D. Electric Co., San Antonio, magneto trouble finders.
Oxweld Acetylene Co., Thirty-sixth and Jasper Place, Chicago, blowpipe and extras for welding outfit.
Buffalo Aeroplane Corp., Buffalo, services and material.
Harrison Radiator Co., Lockport, radiators.
Bosch Magneto Co., New York, starting magnetos.
Wright-Martin Aircraft Corp., New Brunswick, N. J., tools for engines.
Grand Rapids Airplane Co., Grand Rapids, Mich., tools, jigs, dies, etc.

Contracts

The Connecticut Aircraft Co., New Haven, supply bags.
W. H. Mullins Co., Salem, Ohio, spares for planes.

Revise Export Commodity List

WASHINGTON, Oct. 29—A revised export commodity list for European Holland, issued by the War Trade Board, states that the following articles are among those which will be considered for exportation: Automobiles (passenger), bicycles, motorcycles and spare parts but no tires and no accessories. Prospective importers should obtain import certificates from the Netherland Overseas Trust and should upon receipt of the certificate notify the prospective exporter and advise him of the serial number. The exporter in turn will then apply to the War Trade Board for his export license.

Highways Congress for Chicago Dec. 4-5

NEW YORK, Oct. 30—The Highways Industries Association and the American Society of State Highway Officials will hold a highway congress at the Congress Hotel, Chicago, Dec. 4 and 5. The congress will be opened on Wednesday morning, Dec. 4, and will be addressed by Logan Waller Page and Fourth Assistant Postmaster James I. Blakeslee. Speakers at the afternoon session are Governor Cox of Ohio, E. J. Mehren, Editor of *Engineering News-Record*, and Roy D. Chapin, chairman of the Highways Transport Committee. S. T. Henry, third vice-president of the Highways Industries Association, will address the evening session. The speakers for Thursdays session are A. R. Hirst, Paul D. Sargent, J. W. Bliss, H. Eltinge Breed, A. G. Batchelder, A. B. Fletcher, Duncan Buie, Geo. P. Coleman, George M. Graham and H. J. Shirley. It is planned that the congress shall go into every phase of highway construction, maintenance and use.

First "Eagle" Placed in Commission

Washington, Oct. 30—The first of the "Eagle" boats built for the Navy at the Ford Motor Co. plant, Detroit, was placed in commission yesterday, according to an announcement by Franklin B. Roosevelt, Acting Secretary of the Navy.

Calendar

ENGINEERING

Nov. 14-15—New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.

SHOWS

Oct. 30-Nov. 4—Shreveport, La. Tractor demonstration. State Fair.
Nov. 11-16—Phoenix, Ariz. Tractor demonstration. State Fair.
Nov. 11-16—Pittsburgh, Pa. Fall Automobile Show. Motor Square Garden. Automobile Association of Pittsburgh.
Jan. 13-19—Des Moines, Ia. First Tractor Show. Des Moines Thresher & Tractor Club. H. J. Clark, Mgr.

Dissension in the Aero Club

NEW YORK, Oct. 30—That there is organized opposition to the regular ticket proposed for the election of officers of the Aero Club of America on Nov. 11 was made evident to-day when Roy U. Conger, leading the opposition forces, applied to the Supreme Court for an order to compel the officers of the club to supply a list of all members and their addresses or, alternatively, to permit them to be copied.

The officers proposed by the opposition are Howard E. Coffin for president and Cortlandt Field Bishop, Howard Talbot, C. M. Vought and L. L. Briggs as vice-presidents. There is no fight on the proposed governors.

Charles G. Roebling Dead

TRENTON, N. J., Oct. 28—Charles G. Roebling, vice-president of the Mercer Automobile Co., died Saturday, Oct. 25.

Bishop White Passes Away

BRIDGEPORT, Oct. 28—Bishop White, vice-president and general manager of the American Chain Co., and treasurer of Pratt & Cady Co., Hartford, died of pneumonia on Sunday morning at his home, West Hartford. He was 33 years of age. Bishop White was born in West Hartford in 1885. Immediately after finishing college Mr. White became identified with a New York bank, and shortly thereafter started business as a manufacturers' representative in the automobile supply trade, which brought him in contact with the Weed Chain Tire Grip Co., with whom he became associated about 1911. When the American Chain Co. was incorporated in 1912 Mr. White went to Sherrill, N. Y., to organize and manage that company, which later absorbed the Weed Chain Tire Grip Co. after the business had been transferred to Bridgeport. He then became vice-president and general manager of the new corporation, a position which he held at the time of his death. In 1914 Mr. White successfully carried out the reorganization of the Pratt & Cady Co., of which concern he was treasurer. His widow and one child, Bishop White, Jr., survive him.

Twin Disk Clutch and Clutch Pulley

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this case the central disk is the driven one, and the two outer disks are the drivers. The latter are turned with grooves in their circumference, these grooves taking felt packings designed to exclude dust from the friction surfaces.

At the present time the large clutch is made in one size only, with friction disks 11½ in. in diameter, and this is said to be suitable for tractor engines delivering all the way from 30 to 60 hp. The clutch pulley also is built in only one size so far, but other sizes are in contemplation.

Thomas L. Fawick, designer of the clutch and clutch pulley, has had 8 years' experience in tractor work.